TOM FOLLEY W.A.U.
WATERSHED ANALYSIS
TYEE RESOURCE AREA
ROSEBURG DISTRICT, BLM

13 April 1995

Tom Folley Watershed Analysis Unit
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I. Introduction

Watershed analysis is being undertaken on the Tom Folley Watershed Analysis Unit (WAU) as prescribed in the Standards and Guidelines for Management of Habitat for Late-Successional and Old-Growth Forest Related Species Within the Range of the Northern Spotted Owl (S&Gs) (USDA and USDI 1994).

Watershed analysis is the gathering of information on and the description of the physical and biological processes that are active within and between watersheds. The analysis units range between 20 and 200 square miles. The results of this watershed analysis will be utilized to make informed management decisions for the benefit of the natural resources and the people dependent upon them. An interdisciplinary team (ID)(Appendix 1) has been established to conduct the analysis of the Tom Folley WAU.

An outcome of watershed analysis is to identify specific projects that are compatible with the goals and objectives identified in the S&Gs. Mapped and unmapped Late Successional Reserves are to be managed to benefit the development of forest stands containing old growth characteristics. Connectivity lands will be managed to provide for movement, dispersal, and connectivity of plane and animal species, and to maintain ecotypic richness and diversity in the forest matrix. General forest management areas (GFMA) will be managed using intensive forest management practices to maintain a high level of sustainable timber production while maintaining long term site productivity, biological legacies, and a biologically diverse matrix.

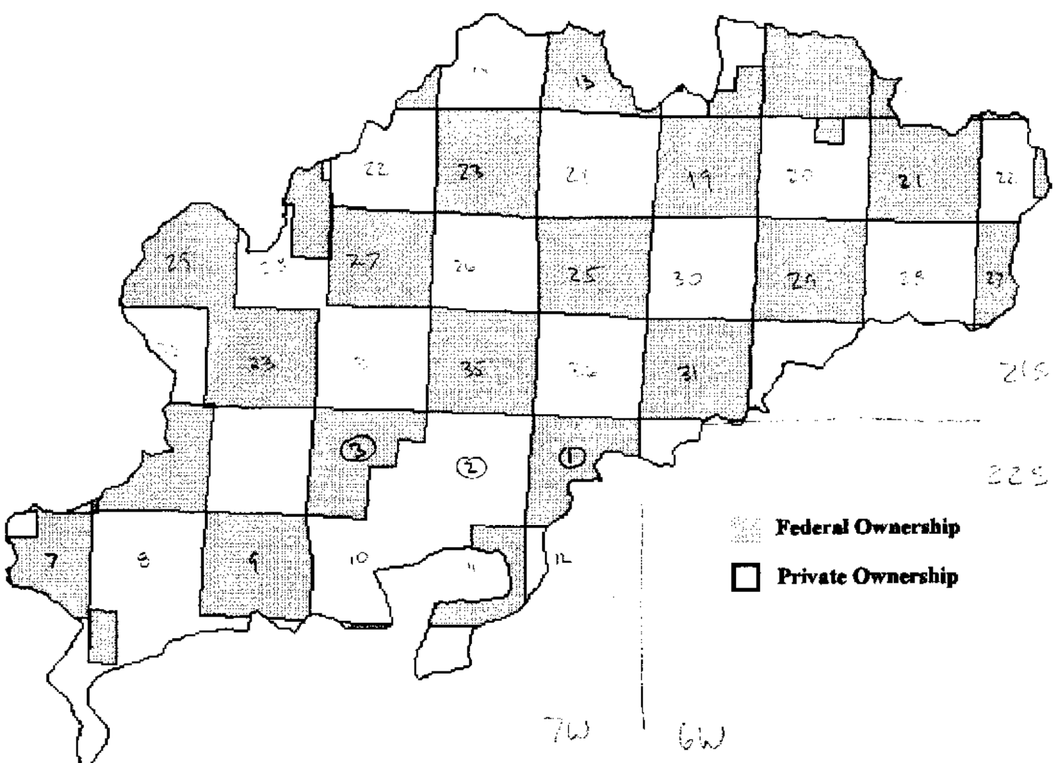
Overlaying connectivity and GFMA is a network or riparian reserves. The riparian reserves are a major component of the Aquatic Conservation Strategy put forth in the S&Gs (USDI and USDA 1994). Management within the reserves will be aimed at promoting the development of late-successional and old-growth forests. Riparian reserves are designed to "maintain and restore riparian structures and functions of intermittent streams, confer benefits to riparian-dependent and associated species other than fish, enhance habitat conservation for organisms that are dependent on the transition zone between upslope and riparian areas, improve travel and dispersal corridors for many terrestrial animals and plants, and provide for connectivity of the watershed." (USDA and USDI 1994:B-13).

Description of Watershed Analysis Unit

The Tom Folley WAU encompasses 20,148 acres of Federal and non-federal lands (Table 1) (Fig. 1). Ownership is distributed in a typical checkerboard pattern. Non-Federal landowners include: A.U. Jones (Seneca Timber Company), International Paper, and other non-industrial landowners.

Table 1. Land ownership within the Tom Folley WAU.		
Landowner	Size (acres)	Percent (%)
BLM - O&C	9839.21	48.84
BLM - PD	150.65	0.75
Private	10158.21	50.42
Total	20148.62	100

Figure 1. Ownership within the Tom Folley WAU



The WAU is further divided into 7 subwatersheds ranging in size from 1547 to 4709 acres (Table 2).

The WAU is located east of Elkton, Oregon in the southern Oregon Coast Range (Fig. 2). Precipitation averages 52.03 inches a year, 60 percent occurring from late November through February. The mean minimum January temperature is 35.9 degrees F, freezing periods, although normal, are short in duration. The mean maximum temperature is 84.3 degrees F. Temperatures over 100 degrees F are not uncommon.

Elevation ranges from 80 feet above mean sea level at the confluence of Elk Creek and the Umpqua River at Elkton, to 1789 feet at the head of the North Fork of Tom Folley Creek. Topographically mature, the drainage area is characterized by steep slopes and sharply defined ridges. Geology is dominated by the Tyee formation of rhythmically bedded, tuffaceous, and micaceous sandstone and siltstone laid down in the Eocene period (Franklin and Dyrness 1984).

Major streams in the WAU include: Little Tom Folley, Big Tom Folley, Saddle Butte, and North Fork of Tom Folley. Little Tom Folley and Big Tom Folley flow directly into Elk Creek; North Fork of Tom Folley and Saddle Butte being tributaries to Tom Folley. Elk Creek flows into the Umpqua River at the southwest corner of the WAU. There are approximately 247 miles of streams in the WAU (Table 3).

The major vegetation zone is western hemlock (<u>Tsuga heterophylla</u>) (Franklin and Dyrness 1984). Dominant tree species in the WAU are Douglas-fir (<u>Pseudotsuga menziensii</u>), western hemlock, western redceder (<u>Thuja plicata</u>), and grand fir (<u>Abies grandis</u>). Subdominant hardwood species include bigleaf maple (<u>Acer macrophyllum</u>) and red alder (<u>Alnus rubrum</u>). Understory shrub and herbaceous species include: vine maple (<u>A. circinatum</u>), rhododendron (<u>Rhododendron macrophyllum</u>), salmonberry and blackberry (<u>Rubus</u> spp.), sword fern (<u>Polystichum munitum</u>), Oregon grape (<u>Berberis nervosa</u>), and salal (<u>Gaultheria shallon</u>).

Table 2. The subwatersheds within the Tom Folley WAU and their areas (fig. 3).		
Subwatersheds	Area (acres)	Percent (%)
Little Tom	4709.8	23.4
Saddle Butte	1546.7	7.7
North Fork	3331.7	16.5
Smith Folley	2096.8	10.4
Folley Headwaters	2527.7	12.5
Big Tom	3278	16.3
Lower Tom	2657.6	13.2
Total	20,148.30	100.0

Figure 2. Location of the Tom Folley WAU.

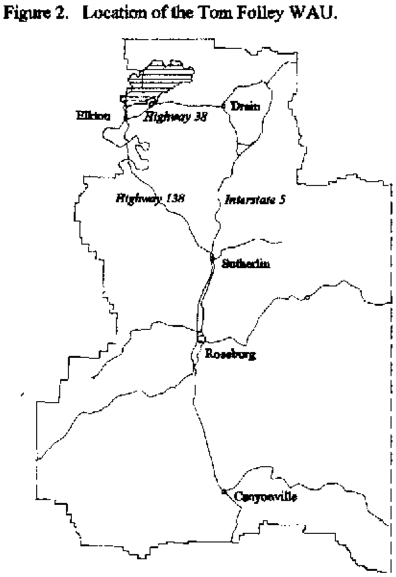


Figure 3. Subwatersheds within the Tom Folley WAU.

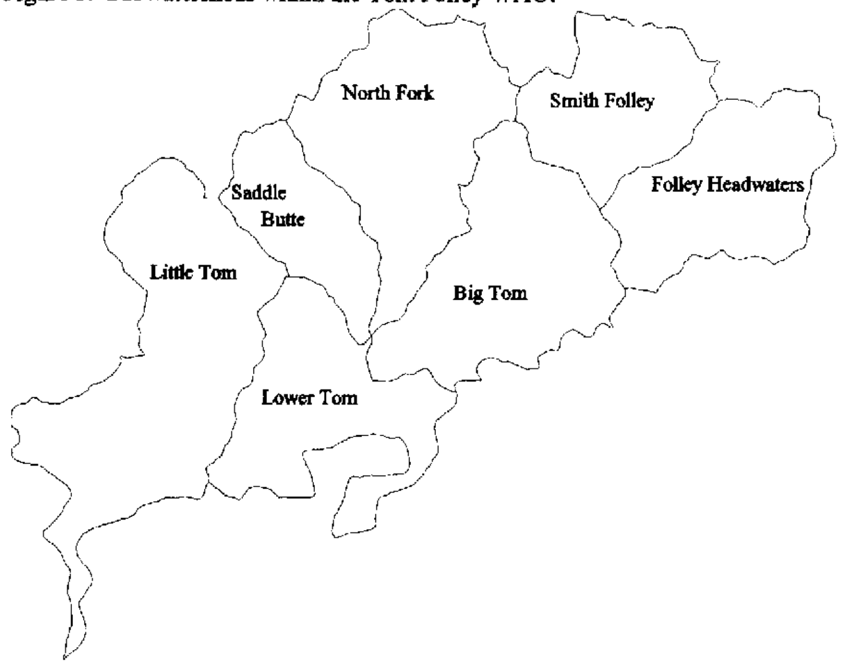
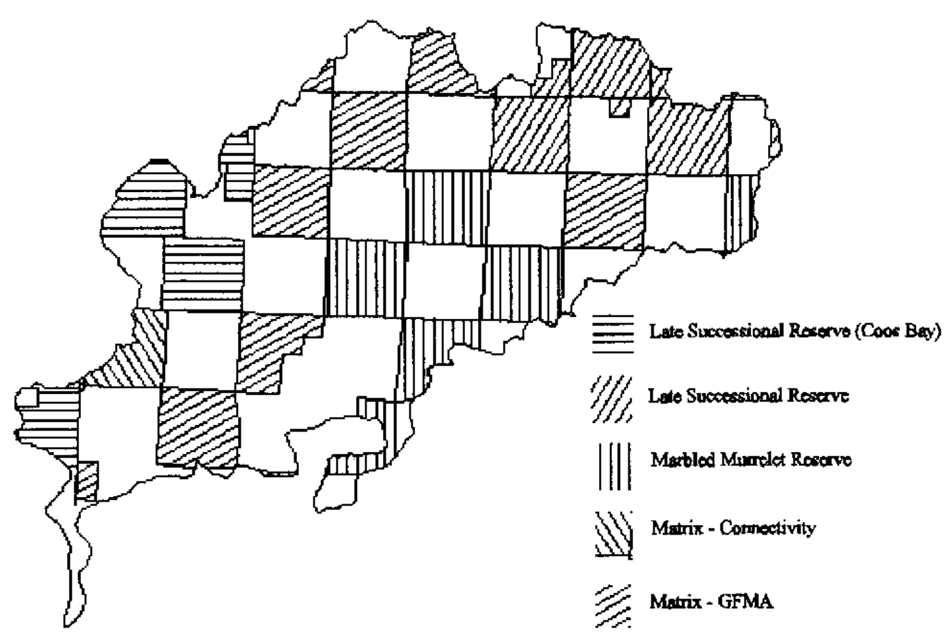


Table 3. Stream mileage within the Tom Folley WAU, subdivided by subwatershed unit.

Stream Order	Little Tom	Lower Tom	Saddle Butte	Big Tom	North Fork	Smith-Folley	Folley Hdwtrs	Total
	miles (%)	miles (%)	miles (%)	miles (%)	miles (%)	miles (%)	miles (%)	miles (%)
UNKNOWN	15.55 (24.4)	10.36 (32.2)	4.10 (21.2)	4.06 (11.7)	2.66 (6.5)	3.53 (14.4)	7.65 (24.4)	47.91 (19.4)
1	18.32 (28.8)	6.03 (18.8)	4.93 (24.6)	11.82 (34.1)	14.69 (35.7)	7.10 (28.9)	10.08 (32.2)	72.97 (29.5)
2	17.07 (26.7)	7.08 (23.0)	6.55 (33.8)	10.94 (31.5)	13.00 (31.6)	9.00 (36.6)	7.95 (25.4)	71.59 (28.9)
3	5.31 (8.3)	2.75 (8.6)	1.13 (5.8)	2.90 (8.5)	5.63 (13.7)	1.79 (7.2)	2.94 (9.4)	22.45 (9.1)
4	3.17 (5.0)	0.65 (2.0)	2.65 (13.7)	1.52 (4.8)	2.11 (5.1)	2.61 (10.6)	1.20 (3.8)	13.91 (5.6)
5	3.03 (4.7)	0.0	0.0	0.0	3.06 (7.4)	0.52 (2.1)	1.50 (4.8)	8.11 (3.3)
6	0.0	1.94 (6.0)	0.0	3.41 (9.8)	0.0	0.0	0.0	5.35 (2.2)
7	1.33 (2.1)	2.98 (9.3)	0.0	0.0	0.0	0.0	0.0	4.31 (1.8)
LAKES AND PONDS	0.0	0.35 (1.1)	0.0	0.0	0.0	0.0	0.0	0.35 (0.1)
Total	63.78 (25.8)	32.14 (13.0)	19.36 (7.8)	34.65 (14.0)	41.15 (16.7)	24.55 (9.9)	31.32 (12.7)	246.95 (100.0)

Federal lands (9990 acres) are managed pursuant to the Roseburg District Timber Management Plan Final Environmental Impact Statement (USDI 1983), as amended by the S&Gs (USDA and USDI 1994). A new Resource Management Plan (RMP) for the Roseburg District, Bureau of Land Management is scheduled for release in late 1994, with the ROD expected to be signed in early to mid-1995. The new RMP will be consistent with the S&Gs (USDA and USDI 1994). Land management classifications within the WAU (Fig. 4): Late Successional Reserve, 3570 acres; Late Successional Reserved (element 2)(MMR), 2681 acres; Connectivity, 400 acres; GFMA, 3340 acres. Six thousand eight hundred eighteen (6818) acres are designated as critical habitat for the northern spotted owl (Fig. 5) (FR 57:1796) and 3,515 acres are proposed as critical habitat for the marbled murrelet (FR 59:3811). Proposed critical habitat for the marbled murrelet, within this WAU, is identical with LSR designation.

Figure 4. Land use allocations within the Tom Folley WAU.



Private forest land within the WAU (10,158 acres) is managed almost exclusively for commercial purposes and may include all or some of the following intensive forest management practices: clearcutting, burning, planting genetically superior stock, mulching, herbicide control of competing vegetation, precommercial thinning, fertilizing, and commercial thinning. Forestry practices on private lands are regulated by the Oregon Forest Practices Act. The Forest Practices Act prescribes such things as riparian buffer widths, wildlife tree retention, restocking levels and timeframes, use of herbicides and pesticides, and protection for state threatened and endangered species. Less than 2 percent of private forestlands contain stands more than 75 years of age (Table 4, Fig. 6).

Figure 5. Spotted owl critical habitat within the Tom Folley WAU.

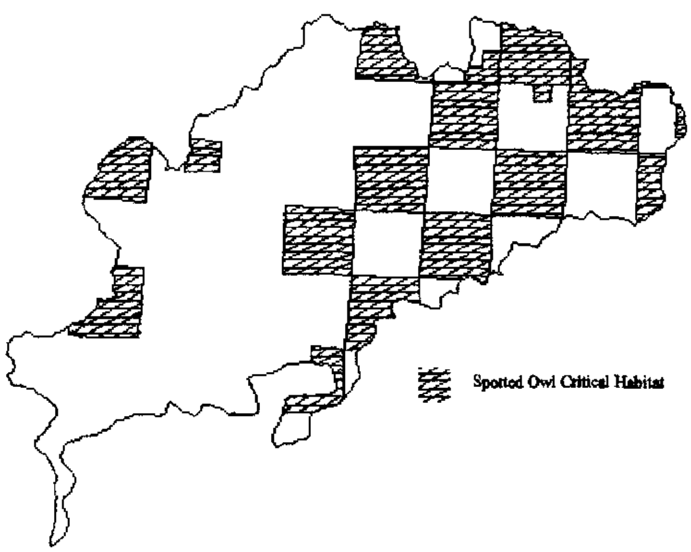
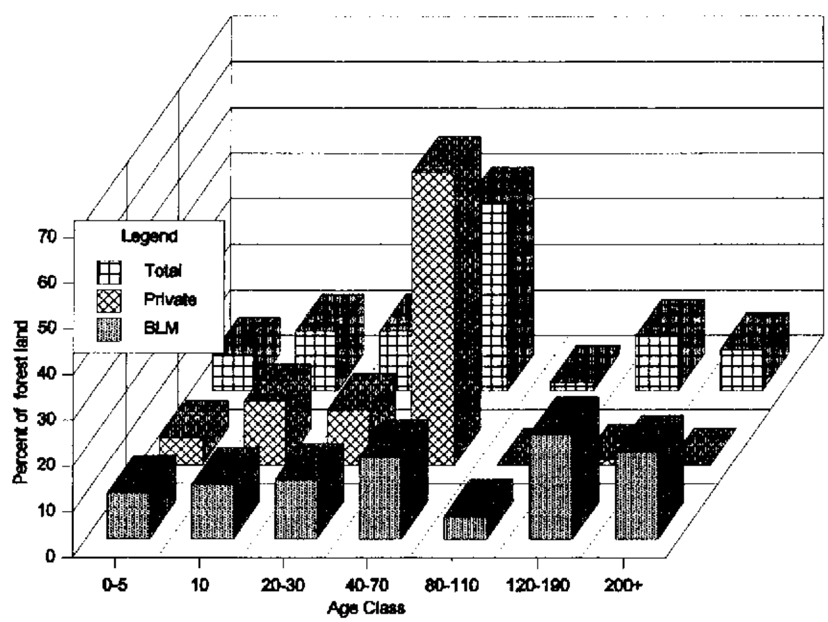


Table 4. Age class breakdown of forest lands within the Tom Folley Watershed Analysis Unit.			
Age Class (years)	BLM Forest Land (acres(%))	Private Forest Land (acres(%))	Total (acres(%))
0-5	1021 (10)	642 (6)	1663 (8)
10	1213 (12)	1380 (14)	2593 (13)
20-30	1323 (13)	1241 (12)	2564 (13)
40-70	1780 (18)	6522 (64)	8302 (41)
80-110	460 (5)	11 (*)	471 (2)
120-190	2317 (23)	129 (1)	2446 (12)
200+	1874 (19)	0 (0)	1,874 (9)
Total	9,988.00	9,925.00	19,913.00
* less than 1 percent			

Figure 6. Age class breakdown of forest lands within the Tom Folley WAU



II. Issues

The ID team identified the following issues to be of major concern in this WAU. They are:

1. Roads

    a. Conditions -- what conditions are the roads in and what problems are they causing to environment? Are there erosion and sedimentation problems that need to be controlled?

    b. Density -- what are the road densities? Are there roads that can be closed or "put to bed" to the benefit of the other resources?

    Information needs: road length, surfacing materials, surface condition

2. Threatened and Endangered Species (TES) -- this includes BLM special status species and those species of concern identified in Table C-3 of the Standards and Guidelines. Management activities must comply the Endangered Species Act of 1973, as amended; with BLM regulations; and with the requirements of the President's Forest Plan.

    Information needs: known occurrences, potential occurrences, critical habitat

3. Riparian and Fish Resources -- The maintenance and restoration of riparian areas and the aquatic environment is a key component of the President's Forest Plan. Compliance with the Clean Water Act is a major concern for all management activities.

    Information needs: stream lengths, dominant riparian covertype, water quality problems, fish habitat deficiencies, fish usage

III. Analysis

1. Roads

There area at least 88.40 miles of roads within the Tom Folley WAU (Table 5). Road surfaces include: dirt, gravel, and pavement. This mileage figure does not reflect all roads within the WAU, only those roads that are mapped on our GIS. Additional roads exist on the ground but are not reflected in our GIS; this may be due to the deterioration of their physical condition or encroachment of vegetation. Additionally, roads and spurs are continuously being built or reconstructed to facilitate forest management. Roads mapped in the soils report (Appendix 2, folders 5 and 6) identifies many of these roads.

Road densities vary from 2.04 to 3.99 mi./sq. mi. within the subwatershed units; the overall road density within the WAU is 2.80 mi/sq. mi. (Table 5).

Table 5. Road mileage and densities within the subwatersheds of the Tom Folley WAU; densities are expressed as miles of road per square miles of area (mi./sq. mi.).

	ROAD SURFACE (miles)			
	Pavement (density)	Gravel (density)	Dirt (density)	Total (density)
Little Tom	1.16 (0.16)	13.24 (1.80)	9.19 (1.25)	23.59 (3.25)
Lower Tom	0 (0)	7.27 (1.75)	3.59 (0.86)	10.86 (2.86)
Saddle Butte	3.92 (1.62)	2.74 (1.13)	3.00 (1.24)	9.66 (3.99)
North Fork	0.48 (0.09)	9.31 (1.79)	4.64 (0.89)	14.43 (2.77)
Big Tom	0.01 (0.01)	8.43 (1.65)	3.84 (0.75)	12.27 (2.39)
Smith Folley	0 (0)	5.16 (1.57)	1.56 (0.48)	6.72 (2.04)
Folley Head	0 (0)	6.99 (1.77)	3.87 (0.98)	10.86 (2.75)
Total	5.57 (0.18)	53.14 (1.69)	29.69 (0.94)	88.40 (2.80)

Field examinations of the roads within the WAU identify approximately 19 miles of roads in a highly eroded condition (Appendix 2-a, folder 6); for this analysis a highly eroded road is one exhibiting extensive rilling, frequently deeper than 2 inches; and deep downcutting in the ditches.

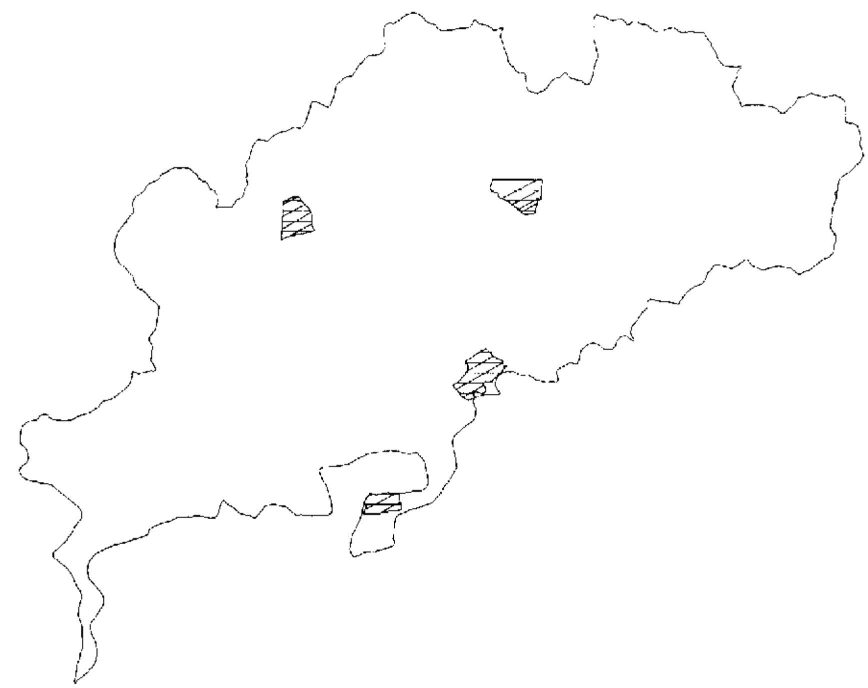
A review of past aerial photo series indicated a shift in road building techniques. Prior to 1980 many roads were built along the stream bottom with spurs running up the draws; recent road construction activities were moved to the upper slopes and to the ridgetops. Additionally, there has been a shift away from extensive sidecasting, a major cause of landslides on steep slopes. Many landslide events were related to road building activities (Appendix 2-a, folder 3).

Many areas have insufficient access for management activities, not because of the lack of roads but because the road conditions have been allowed to deteriorate to a point where the road is no longer passable. Lack of maintenance has allowed roads to eroded badly, allowed vegetation to encroach from the sides and choke out the road, or to grow from the prism.

2. Threatened or Endangered Species

Four activity centers for the northern spotted owl (NSO) are known within the WAU (Fig. 7). The entire area has been surveyed to USFWS protocol, each year, since 1990. Only one activity center occurs in matrix; the other three occur in either mapped or unmapped LSR. Residual habitat areas, approximately 100 acres in size, have been designated for each spotted owl activity center.

Figure 7. Spotted owl residual habitat areas within the Tom Folley WAU.



No marble murrelets are known to inhabit the WAU. Approximately 360 acres of suitable murrelet habitat have been survey in the last 2 years.

Coho, sea-run cutthroat, and steelhead are known to utilize this stream system. Coho and steelhead have been petitioned for listing pursuant to the Endangered Species Act of 1973, as amended (ESA). Cutthroat have been proposed for listing under the ESA.

3. RIPARIAN RESOURCES

There are 247 miles of streams (permanent and intermittent) within the Tom Folley WAU, 144 miles are 1st or 2nd order streams (Table 3).

Approximately 14 percent of the stream mileage has an alder overstory (Table 6, Fig. 8). Estimations based upon mapping exercises place approximately 64 percent of the alder cover on 3rd order and greater streams (Table 6).

Table 6. Forest cover within the riparian area of the Tom Folley WAU.

Subwatershed	Stream Length (miles)	Alder Cover			
		All Streams		3rd+ order	
		mi.	%	mi.	%[1]
Little Tom	63.78	8.61	13.50	6.37	17.93
Saddle Butte	19.35	2.41	12.45	1.29	3.63
North Fork	41.19	11.42	27.73	5.18	14.03
Lower Tom	32.14	1.96	6.10	1.66	4.67
Big Tom	34.71	5.16	14.87	3.89	10.95
Smith-Folley	24.54	3.53	14.38	2.49	7.01
Folley Headwaters	31.32	2.43	7.76	1.92	5.40
Total	247.03	35.52	14.38	22.80	64.19

[1] percentage of streams with alder cover.

Due to stand mapping criteria alder dominated stream cover does not tend to show up on the forest stand maps. Alder cover was derived from photo interpretation and mapped by hand.

Riparian reserves were established around all streams within the WAU, regardless of ownership, in order to establish a baseline condition. Riparian reserve widths, as prescribed in the President's Forest Plan, are requirements only on Federal lands. Private landowners are required to follow state requlations when buffering streams. These reserve widths were only applied for comparison purposes.

Following the S&Gs (USDA and USDI 1994) all fish bearing streams were buffered by the height of 2 site potential trees and all intermittent streams by 1 site potential tree. Riparian reserve widths were defined as ground distances. For analysis purposes, all fish bearing streams were buffered by 355 feet (horizontal) and all intermittent stream by 177.5 feet (horizontal). Fish bearing streams were defined as all streams mapped in GIS on the HYD themes--streams mapped from photos and 7.5 minute quads on to the ORD themes were considered to be intermittent streams. Project specific analysis will determine the actual buffers required.

Riparian reserves encompass 14,067 acres, 99 percent are forested (Table 7). Twenty-four percent of the reserves are greater or equal to 80 years of age (Table 7). Ninety-three (93) percent of the forest land greater than or equal to 80 years of age occur on federal land (Fig. 9, Table 7).

DEQ 1988 indicates a "moderate" water quality problem for Tom Folley Creek. Moderate problems were identified because of increased nutrient and sediment loadings and due to a lack of stream and streambank structure. Coldwater fisheries and other aquatic lifeforms have also shown negative effects.

ODFW has completed stream surveys on a large portion of this stream system. Their data have identified a lack of large woody debris, lack of pool habitat, and lack of spawning gravel within the system.

Sedimentation has entered the system as a result of a number of human induced disturbances. Road building and harvest activities have resulted in a number landslide events. Of the landslide events the majority of the large scale events have resulted from road building activity. For this analysis, large scale events encompass areas greater than 0.5 acres. Aerial photo review has revealed only 2 apparently natural events in the last 40 years.

Riparian areas, draw bottoms, and stream channels damaged directly by landslide activity, road placement, and cat skidding in the past seem to have almost completely recovered from an erosion standpoint. Gravel beds and instream structure may not have yet recovered from the massive sedimentation of the past. The current source of sediment into the stream system is from unsurfaced roads and inadequately designed, road drainage systems.

Historic stream cleaning practices that removed large woody debris from stream channels are still affecting the stream system, as indicated in the DEQ and ODFW analyses.

Figure 9. Forest age class distribution within the riparian reserves.

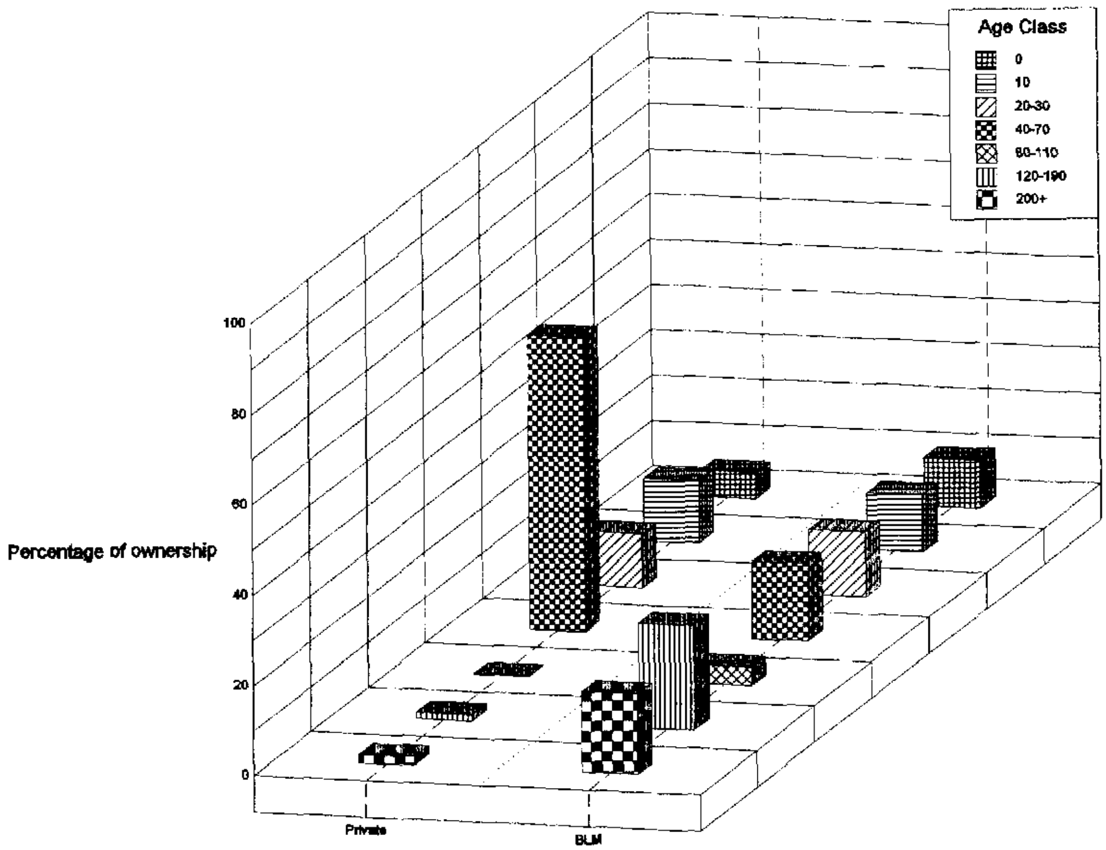


Table 7. Forest age class distribution, on federal lands, within riparian buffer zones, by subwatershed.

Age Class	Little Tom		Lower Tom		Saddle Butte		Big Tom		North Fork		Smith Folley		Folley Hdwtrs		Total	
	acres	%	acres	%	acres	%	acres	%	acres	%	acres	%	acres	%	acres	%
0-5	203.3	12.6	84.7	12.1	0	0	107.6	10.8	157.9	14.8	128.1	13.9	59.8	6.1	741.4	10.7
10	263.7	16.3	19.3	2.8	107.0	16.2	104.4	10.5	219.4	20.6	71.7	7.7	72.5	7.4	858.0	12.7
20-30	524.0	32.4	85.0	12.2	83.2	12.6	53.5	5.4	123.9	11.6	1.01	12.9	126.9	12.9	997.5	14.4
40-70	188.1	11.6	183.3	26.3	234.9	35.3	58.4	5.9	206.3	19.4	48.2	27.8	273.7	27.8	1192.9	17.2
80-110	0	0	11.8	1.7	94.1	14.2	18.9	1.9	122.5	11.6	49.1	0	0	0	296.4	4.2
120-190	166.1	10.3	277.9	39.9	123.9	18.7	246.1	24.7	106.8	10.0	588.7	10.3	100.8	10.3	1610.3	23.2
200+	272.0	16.8	34.3	4.9	17.8	2.7	407.7	40.9	126.8	11.9	36.3	35.5	349.5	35.5	1244.4	17.9

Forest age class distribution, on private lands, within riparian buffer zones, by subwatershed.

Age Class	Little Tom		Lower Tom		Saddle Butte		Big Tom		North Fork		Smith Folley		Folley Hdwtrs		Total	
	acres	%	acres	%	acres	%	acres	%	acres	%	acres	%	acres	%	acres	%
0-5	92.3	5.6	47.6	4.7	54.2	11.9	211.9	18.4	3.6	0.2	0.2	*	0	0	409.8	5.8
10	320.8	19.3	122.7	12.2	149.4	32.8	97.8	8.5	166.0	12.1	53.4	8.5	72.2	8.5	982.3	13.8
20-30	449.0	27.1	0	0	83.6	18.4	121.2	10.5	151.4	11.0	0	0	42.0	4.9	847.2	11.9
40-70	716.4	43.2	765.3	76.2	165.2	36.3	717.9	62.5	1049.4	76.6	584.0	91.5	648.1	76.4	4636.3	65.1
80-110	2.9	0.2	0	0	2.7	0.6	0	0	0	0	0	0	0	0	5.6	0.1
120-190	5.4	0.3	0.8	0.1	0	0	0	0	8.6	0.6	0	0	86.4	10.2	101.2	1.4
200+	70.0	4.2	68.0	6.7	0	0	0	0	0	0	0	0	0	0	138.0	1.9

* less than 0.01%

IV. Desired Future Conditions (DFC)

The DFCs will be described based upon the three main land use classifications in this WAU; LSR (including MMR), riparian reserve, and matrix. Complete descriptions of the management strategies for these classifications can be found in the S&Gs (USDA and USDI 1994).

Basically, the LSRs will be managed to develop LS/OG characteristics on those lands which currently do not contain them and to prevent large-scale disturbances that would limit the ability of the LSRs to sustain the populations of LS/OG species. LS/OG characteristics include: the occurrence of a variety of vegetation species within a stand, large trees, large standing snags and downed logs, multiple canopy stratifications, and large amount of defect and decadence within the stand. It is within these reserves that the LS/OG species will be maintained.

There are 6940 acres of riparian reserves on Federal lands, within the Tom Folley WAU, 99 percent are forested. Riparian reserves will serve as corridors to facilitate the movement of species between the large LSRs, to protect stream integrity, provide for the management of fish and riparian species, and to protect the habitat needs of a variety of late-successional, terrestrial species.

The matrix (general forest management areas and connectivity areas) should provide for the production of commercial products while maintaining a specified amount of biological legacies (snags, downed woody debris, etc.). Ecological diversity will be increased on federal lands by providing early-successional habitats.

A fourth land use classification is that of privately-owned, commercial forest lands. While it is not within the management prerogative of the S&Gs (USDA and USDI 1994) its management must certainly be considered at a landscape level, especially in a checkerboard ownership pattern. Privately-owned, commercial forest lands will continue to be managed for the yield of commercial products. Management on those lands will continue to follow the Oregon Forest Practice Rules (OAR 629:24). The forest practice rules will direct management of private forest lands to be consistent with the sound management of soil, air, water, and fish and wildlife resources. Most likely these lands will continue to provide ample early and some mid-successional habitat.

V. Future Project Needs

It is anticipated that the majority of management activities within this WAU can take 1 of 3 forms: old growth restoration, riparian restorations/fisheries restoration, commercial harvest/forest management.

Old Growth Restoration

Old growth restoration projects will occur mainly within the LSRs (mapped and unmapped). The emphasis of these projects will be to either protect the current old growth conditions or to foster the development of LS/OG like conditions within previously entered stands (USDA and USDI 1994:B-5). Standards and guidelines for the LSR prohibit activities within stands greater than 80 years of age. Approximately 2680 acres of forest land less than 80 years old occur within the LSRs and MMRs (Table 8 , Fig. 10).

Density management (intermediate harvest) would be an option within the stands less than 80 years old. The goal of the density management would be to accelerate the diameter and height growth of the residual stocking, favor the survival of trees containing structural defect, effect the establishment of a multiple canopy, encourage the development of a variety of plant species, put some woody debris on the grand and overall accelerate the development of LS/OG characteristics. Other management opportunities that may exist in these stands are operations designed to create snags, place down woody debris, creating defect, and inter/under planting with minor tree species.

Fuel buildups in natural stands are not a concern for future stand management. Walstad, et al. (1990) states "It is unlikely that 80 years of fire exclusion has produced unnatural fuel accumulations in westside forests..." The ROD states "...that manipulation of natural stands to reduce fire hazard is generally not necessary due to lower fire occurrence..." (USDA and USDI 1994). The ROD further states that fuels management treatments would be desirable in plantations.

Table 8. Age class breakdown of forest lands within the late successional reserves of the Tom Folley watershed analysis unit.

Age Class (years)	Amount of LSR	
	acres	percent
0-5	426	6.56
10	773	11.90
20-30	663	10.20
40-70	818	12.59
80-110	403	6.20
120-190	1226	18.87
200+	2189	33.69
Total	6,498.00	100.01

Riparian/Fisheries Restoration

Riparian and fisheries projects could occur across the landscape. These projects would occur in compliance with component 4 of the Aquatic Conservation Strategy (USDA and USDI 1994:B-12). Projects within the riparian reserves would be designed to maintain and restore riparian functions (USDA and USDI 1994:B-13). Riparian reserves serve as large woody debris sources for the streams, ameliorate upslope sedimentation, moderate climatic fluctuations within the stream, provide specialized habitats for many vertebrate and invertebrate species, and serve as corridors

-- providing dispersal habitat and connecting LSRs.

Alder is a natural component of riparian areas. Naturally, alder is quick to colonize disturbed sites, stabiliz~~ing~~e soils, shad~~ing~~e streams; the annual fall of leaves adds organic matter to the stream systems, and they function to cycle nitrogen (faster than if Douglas-fir and their associated mycorrhizal ~~micro-rhizal~~ mats has to re-establish post-distrubance).Past logging practices have allowed the development of unnaturally large, alder dominated stands. Alder stands can be self perpetuating by forming dense canopies that shade out other tree species; they are also prolific seeders. While alder does provide habitat for a large number of species and preserves many riparian functions it fails in at least 3 respects: 1) it does not form large diameter, long lasting, large woody debris; and 2) it is deciduous and loses its ability to moderate adverse, winter conditions; and 3) it delays the development of LS/OG conditions necessary for the survival and dispersal of many LS/OG associated species..

Alder conversion/supplementation would involve opening up the canopy of alder stands to allow for the release of naturally occurring conifers or to allow for the establishment of planted conifers. Conifers are important because they will develop into the large diameter trees that are necessary to provide, 1) long lasting, large down woody debris necessary for riparian associated vertebrate and invertebrate species, 2) to provide large wood necessary to provide needed structure in the streams, and 3) will provide large diameter snags and cavities for other vertebrate and invertebrate species.

As a result of past stream cleaning practices and erosion events, spawning gravel have been silted in or washed away and structural components necessary to form rearing and overwintering pools have been reduced. Future projects would be aimed at supplementing the natural system providing habitat for the reproduction and development of potentially endangered anadromous fish stocks, until natural systems can recover. Appropriately sized, clean river rock could be placed in the stream to supplement and enhance the spawning gravel. Structures could be added to the streams to facilitate the development of spawning beds and rearing/overwintering pools.

Road culverts that prohibit the passage of anadromous fish to spawning beds will need to be replaced or modified to allow passage; in accordance with S&G RF-6 (USDA and USDI 1994:C-33).

Without addressing the sedimentation problem, the efficacy any instream projects may be seriously reduced. There are approximately 19 miles of roads that are considered to be highly erosive (Appendix 2-a, folder 6). Federal roads that are contributing sediment into the stream system need to be reconstructed or closed, in order to minimize those impacts. Road closure could vary from simply blocking (with gates, boulders, or ditches) to allow the road to revegetate and recover naturally; to obliteration. At its extreme, obliteration could involve backfilling, recontouring, and revegetating the slope.

Another sedimentation control project would involve identifying potential and existing mass wasting problems and attempting to control or reduce the problem. A potential problem area exists on Lookout Mountain (T21S-R6W-S17-NE/SE) at a waste earth disposal site. The project would potentially involve removing some of the overburden to lessen the potential of slope failure.

To accelerate the development of LS/OG characteristics necessary to meet the role of habitat and dispersal corridors for LS/OG associated species management opportunities may include various levels of density management, creation of snags and downed woody debris, and the planting of minor tree species.

Commercial harvest/Forest management

Regeneration harvests and forest management aimed at developing commercially, harvestable stands are mainly occurring on lands within the matrix. Standards and guidelines specific to matrix land are listed, beginning on page C-39 of USDA and USDI (1994).

Commercially oriented, forest management may include the following components: commercial harvest using aerial, cable, and/or ground based systems; green tree and snag retention; downed woody debris retention; protection of special status species and special habitat areas; slash treatments, such as burning or piling; planting a species mix of genetically superior seedlings; suppression of competing vegetation; precommercial thinning; commercial thinning; and fire suppression.

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Appendix 1. List of ID team members

Member	Title -- coverage
Dan Cressy	Soil Scientist -- soils
Rick Kottke	Forester -- silviculture/forest management
Kevin Cleary	Fuels Management Specialist -- fire history/fuels management
Joe Witt	Wildlife Biologist -- wildlife management/TES
Evan Olson	Natural Resource Specialist -- botany/hydrology/fisheries/TES
Mike Haske	Natural Resource Specialist -- team leader
Lyle Andrews	Engineer -- roads
Gary Passow	Natural Resource Specialist -- GIS
Chris Foster	Resource Forester -- Watershed analysis preparation

To: Tyee Plans Forester

From: Tyee Soil Scientist

Subject: Soils Report for Tom Folly LAU Watershed Analysis

Table of Contents:

Dan Cressy

Landforms:

1. Elevations: 80 ft at the town of Elkton where Elk Creek enters the Umpqua River to 1757 ft. at the divide between the Big Tom Folly watershed and the Little South Fork of the Smith River watershed.

2. Geomorphology: Erosion of a series of synclinal anticlinal and monoclinal folds have formed enlongated basins highly dissected with generally steep sided draws. Relief is typically 1,000 ft from basin bottom to ridgetop. Sloping benches are common.

3. Geologic Formation: The area is composed of Tyee sandstone and siltstone sedimentary rocks of the Coast Range Mountains. The dip of the strata is generally in a southerly direction (southwestern is most common). Dips, however, occur in all directions. The strata range from being finely bedded and brittle to massive and both hard and brittle. A common arrangement is thick, massive sandstone strata alternating with thinner, finely bedded siltstones and fine sandstone layers which are soft, brittle and highly fractured. The massive sandstone may have vertical joints with spacings of two feet or more.

4. Slopes: The distribution of slope classes in the Tom Folly LAU is given in the table below. A little over half of the area is in slopes steeper than 60 percent. The 60 to 90 percent slope class includes slopes greater than 90 percent but they are considered to be of relatively small extent. See soils map (#   ) for slope class distribution

Table # 1

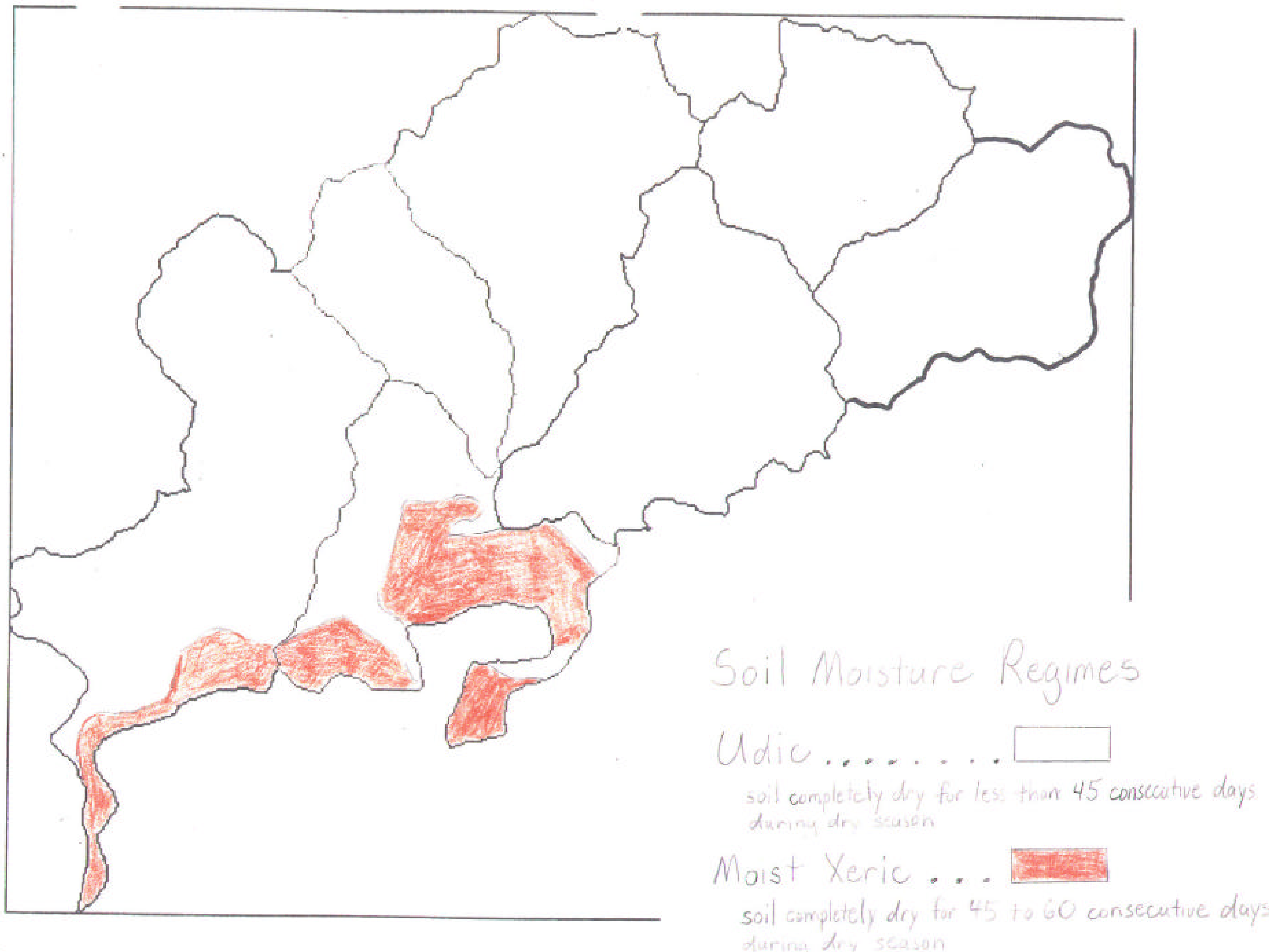
	< 30% slope		30-60% slope		60-90% slope		
	% of area	acres	% of area	acres	% of area	acres	total acres
Little Tom	20	942	30	1413	50	2355	4,709
Saddle Butte	22	340	33	511	45	696	1,547
Lower Tom	38	1,010	25	665	37	983	2,658
North Fork	5	167	17	566	78	2599	3,336
Big Tom	24	787	36	1,180	40	1,311	3,278
Smith Folley	3	63	30	629	67	1,405	2,097
Folley Head	18	455	27	683	55	1,390	2,528
Tom Folly LAU	19	3764	28	5647	53	10,739	20,148

Soils: The following information was collected from the Soil Conservation Service Douglas County Soil Survey.

1. All of LAU occurs within the western hemlock vegetation zone. This zone borders the drier grand fir/salal zone along the ridgeline of Tom Folly Mountain in the SE corner of the LAU.

2. Two soil moisture regimes occur within LAU. The moist xeric occurs in the SW corner of the LAU occupying about 10% of its area. The moist xeric soils are completely dry for 45 to 60 consecutive days in the dry season. Precipitation is about 50 to 55 inches per year. The wetter Udic soils are completely dry for less than 45 consecutive days during the dry season. Site index information seems to suggest that the Udic soils are slightly more productive than their equivalent xeric soils within the LAU (see tables 6+7). I would predict that the lower elevation south facing slopes in the Udic Zone are Xeric.

3. All soil depths from shallow (10 to 20 inches to bedrock) to very deep (greater than 60 inches) are well represented within the LAU. The shallow soils tend to be very gravelly, loamy, occur over hard bedrock and occupy the steeper slopes. Site index information show



Soil Moisture Regimes
Udic . . . .
soil completely dry for less than 45 consecutive days during dry season
Moist Xeric . . .
soil completely dry for 45 to 60 consecutive days during dry season

4

that the shallow soils are significantly less productive than the moderately deep soils (20 to 40 inches to generally soft sandstone and siltstone bedrock). The moderately deep soils only seem to be slightly less productive than their deeper equivalents. (See tables 6 & 7)

4. About one third of the LAU is covered by soil mapping units which have shallow soils as a major component. Within these soil mapping units (233G, 237G, 240G, 437F and 437G) shallow soils occupy 25 to 35% of the total area.

Breakdown by sub-basin of the percent area occupied by these mapping units containing shallow soils as a major component:

Little Tom	40% (1900 acres)
Saddle Butte	15% (230 acres)
Lower Tom	25% (670 acres)
North Fork	60% (2,000 acres)
Smith Folly	25% (520 acres)
Folly Head	15% (380 acres)
Total FAU	32% (6,500 acres)

5. Soils with clayey subsoils are in the 209C, 209E, 211E, 305E 310E, and 310F soil mapping units. These soils are on slopes less than 60 percent. They dominate many areas with slopes less than 30 percent. Clayey soils retain more water ~~water~~ and hold it longer than other soils. The window of opportunity for doing projects on them during the dry season is consequently less. Their porosity and structure are easily suseptible to severe damage from compaction and puddling when wet.

6. Soil mapping units 19A through 71A are nearly level floodplain soils of the major creeks. They were only mapped out on parts of Elk and Big Tom Folly Creeks. They occur elsewhere as small inclusions of other mapping units. Soil drainage ranges from somewhat excessively to poorly drained with high water tables. Their acreage extent is small.

7. Soil mapping units 209C to 437G are upland soils which are dominantly well drained. Rock outcrop as a major component occupies the 237G, 437F and 437G mapping units. 237G, 437F and 437G also contain shallow soils as a major component.

Soil Mapping Units in Tom Folly LAU

see included Soils Map

19A = Kirkendall - Nekoma complex, 0 to 3% slopes

21A = Quosatana silt loam, 0 to 3% slopes

25A = Evans loam, 0 to 3% slopes

27A = Chapman - Chehalis complex, 0 to 3% slopes

35A = Newberg fine sandy loam, 0 to 3% slopes

45A = Newberg loamy sand, 0 to 3% slopes

61A = Roseburg loam, 0 to 3% slopes

71A = Sibold fine sandy loam, 0 to 5% slopes

209C = Windygap silt loam, 2 to 12% slopes

209E = Windygap silt loam, 12 to 30% slopes

211E = Windygap - Bellpine complex, 12 to 30% slopes

225F = Bateman silt loam, 30 to 60% slopes

233G = Atring - Larmine complex 60 to 90% slopes

237G = Atring - Larmine - Rock outcrop complex,
60 to 90% slopes

240G = Digger - Bohannon - Umpcoos complex,
60 to 90% slopes

270F = Rosehaven loam, 30 to 60% slopes

275G = Littlesand - Rosehaven - Atring complex,
60 to 90% slopes

305E = Honeygrove gravelly clay loam,
3 to 30% slopes

310E = Honeygrove - Peavine complex, 3 to 30% slope

310F = Honeygrove - Peavine complex, 30 to 60% slopes

311E = Preacher - Bohannon complex, 3 to 30% slopes

311F = Preacher - Bohannon - Xanadu complex,
30 to 60% slopes

325E = Orford gravelly silt loam, 3 to 30% slopes

325F = Orford gravelly silt loam, 30 to 60% slopes

350G = Preacher - Bohannon - Digger complex,
60 to 90% slopes

370E = Fernhaven gravelly loam, 3 to 30% slopes

370F = Fernhaven gravelly loam, 30 to 50% slopes

375F = Fernhaven - Digger complex, 30 to 60% slopes

376G = Digger - Preacher complex, 60 to 90% slopes

377E = Xanadu gravelly loam, 3 to 30% slopes

437F = Digger - Umpcoos - Rock outcrop complex, 30 to 60% slopes

437G = Digger - Umpcoos - Rock outcrop complex, 60 to 90% slopes

Soil Series Characteristics

Table # 2

Soil Series	Soil Depth*	Surface Texture	Subsurface Texture	Available Water Capacity 20" to 60"	Soil Temperature Regime	Soil Moisture Regime	Doug Fir Site Index 50YR King	Doug Fir Site Index 100YR McCardle
1. Atring	MD to soft SS	Gr loam	GRV loam	2.4/3.0	mesic	45-60 dry Xeric	98	126
2. Bateman	VD	Silt Loam	Silty Clay Loam	4.0/10.5	mesic	45-60 dry Xeric	118	153
3. Bellpine	MD to soft SS+SiS	Silt Loam	Silty Clay	3.6/4.5	mesic	45-60 dry Xeric	111	146
4. Bohannon	MD to soft SS	Gr loam	Gr loam	2.0/4.0	mesic	Udic	113	154
5. Chapman	Very Deep	loam	loam	3.4/10.0	mesic	Xeric	120	—
6. Chehalis	Very Deep	Silt loam	Silty Clay Loam	4.0/11.0	mesic	Xeric	130	—
7. Digger	MD to soft SS	GRV loam	GRV loam	2.0/3.5	mesic	Udic	111	150
8. Evans	Very Deep	loam	F+VFSL	3.4/11.0	mesic	Xeric	—	—
9. Fernhaven	VD to SS+SiS	Gr loam	Clay Loam	3.0/11.5	mesic	Udic	120	163
10. Honeygrove	VD to SS, SiS + volcanic	Gr CL	Clay	3.6/9.0	mesic	Udic	116	158
11. Kirkendall	Very Deep	Silt loam	Silty Clay loam	4.0/11.0	mesic	Udic	122	—
12. Larmine	Sh to hard SS	Gr loam	GRV loam	1.8/1.8	mesic	45-60 dry Xeric	82	112
13. Littlesand	MD to soft SS	Gr loam	Gr+Cob CL	3.0/4.0	mesic	Xeric	112	144
14. Nekoma	Very Deep	Silt loam	VFSL + FS	4.0/8.0	mesic	Udic	140	—
15. Newberg	Very Deep	FSL+LS	FSL, LFS, S	2.2-2.8/6.0-7.0	mesic	Xeric	112	—
16. Orford	VD to SS + SiS	Gr SiL	SiCl, Clay	3.5/9.0	mesic	Udic	125	165
17. Peavine	MD to soft SS, SiS, volcanic	SiCL	Clay	3.3/4.5	mesic	Udic	110	147
18. Preacher	VD to SS	loam	loam + CL	4.0/10.5	mesic	Udic	121	164
19. Quosatana	Very Deep	Silt loam	SiCL + SiC	4.0/12.0	mesic	Xeric	—	—
20. Roseburg	Very Deep	loam	CL + L	2.7/10.0	mesic	Xeric	—	—
21. Rosehaven	Very Deep SS+SiS	loam	Clay Loam	3.6/11.0	mesic	60-90 dry Xeric	115	148
22. Sibold	Very Deep	Fine Sandy Loam	loam + SiC	3.2/10.0	mesic	Xeric	—	—
23. Umpcoos	Sh to hard SS	GRV SL	GRV SL	1.4/1.4	mesic	Udic	61	79
24. Windygap	Deep to soft SS+SiS	Silt Loam	Silty Clay	3.5/10.5	mesic	45-60 dry Xeric	118	153
25. Xanadu	VD to SS + SiS	GR Loam	CL + Clay	3.2/9.5	mesic	Udic	111	14[illegible]

* SS = sandstone SiS = siltstone

Table #3

Mapping Unit	Surface Textures	Subsoil Textures
19A	silt loam	silty clay loam & very fine sandy loa
21A	silt loam	silty clay loam & silty clay
25A	loam	fine & very fine sandy loam
27A	loam, silt loam	loam, silty clay loam
35A	fine sandy loam	fine sandy loam, loamy fine sanc
45A	loamy sand	fine sandy loam, fine sand
61A	loam	clay loam & loam
71A	fine sandy loam	loam & silty clay
209C	silt loam	silty clay
209E	silt loam	silty clay
211E	silt loam	silty clay
225F	silt loam	silty clay loam
233G	gravelly loam	very gravelly loam
237G	gravelly loam	very gravelly loam
240G	gravelly & very gravelly loam	gravelly & very gravelly loam
270F	loam	clay loam
275G	gravelly loam, loam	very gravelly clay loam, clay loam
305E	gravelly clay loam	clay
310E	gravelly clay loam, silty clay loam	clay
310F	" "	clay
325E	gravelly silt loam	silty clay loam, clay
325F	gravelly silt loam	silty clay loam, clay
350G	loam, gravelly & very gr loam	loam, clay loam, very gr loam
311E	loam, gravelly loam	loam, clay loam, gr loam
311F	" "	" "

Soil Mapping Unit	Surface Textures	Subsoil Textures
370E	gravelly loam	clay loam
370F	gravelly loam	clay loam
375F	gravelly, very gr loam	clay loam, very gravelly loam
376G	very gravelly loam, loam	very gr loam, loam, clay loam
377E	gravelly loam	clay loam, clay
437F	very gr loam, very gr sandy loam	very gr loam, very gr sandy loam
437G	" "	" "

Table # 4

Soil Mapping Unit	Soil Depth	Available Water to 20"	Available Water to 60"	Soil Moisture Regime	(Douglas Fir) 50 Year SI (king)
19A	Very Deep	4.0"	8.0 to 11.0"	Udic	122-140
21A	Very Deep	4.0	12.0	Xeric	none
25A	Very Deep	3.4	11.0	Xeric	none
27A	Very Deep	3.4	10.0 to 11.0	Xeric	120-130
35A	Very Deep	2.8	7.0	Xeric	112
45A	Very Deep	2.2	6.0	Xeric	<112
61A	Very Deep	2.7	10.0	Xeric	none
71A	Very Deep	3.2	10.0	Xeric	none
209C	Deep	3.5	10.5	Xeric	118
209E	Deep	3.5	10.5	Xeric	118
211E	Mod. Deep to Deep	3.5	4.5 to 10.5	Xeric	111-118
225F	Very Deep	4.0	10.5	Xeric	118
233G	Shallow to Mod. Deep	1.8 to 2.4	1.8 to 3.0	Xeric	82-98
237G*	Shallow to Mod. Deep	1.8 to 2.4	1.8 to 3.0	Xeric	82-98
240G	Shallow to Mod. Deep	1.4 to 2.0	1.4 to 4.0	Udic	61-113
270F	Very Deep	3.6	11.0	Xeric	113
275G	Mod Deep to Very Deep	2.4 to 3.6	3.0 to 11.0	Xeric	98-117
305E	Very Deep	3.6	9.0	Udic	116
310E	Mod. Deep to Very Deep	3.3 to 3.6	4.5 to 9.0	Udic	110-116
310F	Mod. Deep to Very Deep	3.3 to 3.6	4.5 to 9.0	Udic	110-116
311E	Mod Deep to Very Deep	2.0 to 4.0	4.0 to 10.5	Udic	113-121
311F	Mod Deep to Very Deep	2.0 to 4.0	3.2 to 10.5	Udic	111-113
325E	Very Deep	3.5	9.0	Udic	125
325F	Very Deep	3.5	9.0	Udic	125
350G	Mod Deep to Very Deep	2.0 to 4.0	3.5 to 10.5	Udic	111-121

Soil Mapping Unit	Soil Depth	Available Water to 20"	Available Water to 60"	Soil Moisture Regime	50 yr King (Douglas Fir) Site Index
370E	Very Deep	3.0"	11.5"	Udic	120
370F	Very Deep	3.0	11.5	Udic	120
375F	Mod Deep to Very Deep	2.0 to 3.0	3.5 to 11.5	Udic	111-120
376G	Mod Deep to Very Deep	2.0 to 4.0	3.5 to 10.5	Udic	111-121
377E	Very Deep	3.2	9.5	Udic	111
437F*	Shallow to Mod Deep	1.4 to 2.0	1.4 to 3.5	Udic	61-111
437G*	Shallow to Mod Deep	1.4 to 2.0	1.4 to 3.5	Udic	61-111

Soil Mapping Units: A = 0 to 3 percent slopes
C = 2 to 12 percent slopes
E = 12 to 30 percent slopes
F = 30 to 60 percent slopes
G = 60 to 90 percent slopes

Soil Depth: Shallow = 10 to 20 inches to bedrock
Mod (Moderately) Deep = 20 to 40 inches " "
Deep = 40 to 60 inches to bedrock
Very Deep = greater than 60 inches " "

Available Water to 60 inches:
less than 2.5 inches = very low
2.5 to 5.0 inches = low
5.0 to 7.5 inches = moderate
7.5 to 10.0 inches = high
greater than 10.0 inches = very high

Available Water to 20 inches:
less than 2.0 inches = low
2.0 to 3.0 inches = moderate
3.0 to 4.0 inches = high

Soil Moisture Regime:

Xeric: The soil profile is completely dry for 45 to 60 consecutive days during the dry season for most years.

Udic: The soil profile is completely dry for less than 45 consecutive days during the dry season

Table # 7

Upland Soils
Doug Fir 50 YR Site Index (King)

Depth → / Soil Moisture →	Shallow Xeric	Shallow Udic	Mod Deep Xeric	Mod Deep Udic	Deep-Very Deep Xeric	Deep-Very Deep Udic
Atring			98			
Bateman					118	
Bellpine			111			
Bohannon				113		
Digger				111		
Fernhaven						120
Honeygrove						116
Larmine	82					
Littlesand			112			
Orford						125
Peavine				110		
Preacher						121
Rosehaven					115	
Umpcoos		61				
Windygap					118	
Xanadu						111
Average	82	61	107	111	117	119

Table # 6

Upland Soils
Doug Fir 100 YR Site Index (McCardle)

Depth → Soil Moisture →	Shallow Xeric	Shallow Udic	Mod Deep Xeric	Mod Deep Udic	Deep - Very Deep Xeric	Deep - Very Deep Udic
Atring			126			
Bateman					153	
Bellpine			146			
Bohannon				154		
Digger				150		
Fernhaven						162
Honeygrove						158
Larmine	112					
Littlesand			144			
Orford						165
Peavine				147		
Preacher						164
Rosehaven					148	
Umpcoos		79				
Windygap					153	
Xanadu						149
Average	112	79	139	150	151	160

Slope Stability: To get an idea of the extent of the slope instability problem in the Tom Folly LAU and what are the management implications, I made a series of maps on copies of the Elkton and Putnam Valley 7½ minute quad sheets.

On one set of maps (Folder # 2) I plotted landslide events from the aerial photos we have on file from 1959 to 1989. They are color coded to their period of occurrence. There were quite a few missing photos from the 59, 64, 70 and 78 sets. This is especially true of the 59 set. Consequently, I likely under recorded the number of events readily discernable from aerial photographs. A number of small events which went undetected probably exist under dense old growth canopies.

On the set in Folder # 3 I color coded the events according to the likely underlying management cause (roads or clear cuts) or lack of management causes (undisturbed forest or logged land with reestablished trees of at least 20 years of age).

On the set in Folder # 4 I plotted the unhealed landslide scars which remained on the landscape and which may have still been eroding when the 89 photos were taken.

Table # 8

early 1950s to 6/1989
number of events in
Little Tom Folly and Saddle Butte

	small	medium	large	total
(undisturbed) In established Forest	4	0	1	5
Clearcut related	40	35	2 *	77
Road related	26	51	27	104
total	70	86	30	186

percentage of events in
Little Tom Folly and Saddle Butte

	small	medium	large	total
(undisturbed) In established Forest	3	0	<1	3
Clearcut related	21	19	1	41
Road related	14	27	15	56
total	38	46	16	100

Small = < 0.1 acres
medium = 0.1 to 0.5 acres
large = greater than 0.5 acres

* One of the two large clearcut related events might have been caused by channeled flow off a landing and therefore more accurately road related according to Dave Clark who recently visited the site.

In folder # 4 I plotted from field observations landslides which occurred after 89 photo were taken.

I observed many of the larger landslides from the 50's period to present in the field. I took down information such as strike and dips of the strata, the presence or absence of seeps, and road drainage in trying to discern the main causes.

Slope Stability Findings:

1. A large number of landslide events occurred over the past 40 years. Nearly all of the observable events from the aerial photographs are debris avalanches, flows and torrents. Only a small percentage of them are deep-seated slumps.

2. In this report I am arbitrarily calling slides covering less than 0.1 acres as small, 0.1 to 0.5 acres as medium and greater then 0.5 acres as large. Many of the larger slides are a combination debris avalanche, debris flow and debris torrent. Table # 8 gives the size distributions in the Little Tom Folly and Saddle Butte subbasins.

Nearly all of the large events have been road related. Large events in undisturbed forest are apparently infrequent and widely spaced. Only two have occurred in the Tom Folly LAU over the last 40 years (debris torrents in Little Tom Folly and Smith Folly). There could be quite a few small events in undisturbed forest which are not detechtable from aerial photographs.

Over the past 40 years road related slides have been the most frequent and by far compose the largest volume of material moved. Over the past decade volume and numbers of these slides have decreased dramatically (discussed later in report).

3. The majority of road related failures have been debris avalanches resulting from over-loading slopes with cut sidecast. Debris torrents resulting from concentrations of drainage by road have been pretty common and have originated most frequently at headwalls. A small percentage of the road related failures large enough to detect from aerial photographs have been cutslope failures. One cutslope failure at the head of the North Fork of Tom Folly touched off a large sidecast failure.

4. There does not seem to be a very good correlation between strike + dip of rock strata and slope failures although I

suspect strike and dip are probably contributing factors in some of the failures.

5. There seems to be a pretty good correlation between shallow soils over hard bedrock and large sidecast failures.

6. There is a definite historical pattern associated with the failures which have occurred in the Tom Folly LAU. From the 50's to about 1980 a lot of major road construction occurred and sidecasting large amounts of material on steep sideslopes appears to be a common practice resulting in many medium to large debris avalanches and debris torrents. which very negatively impacted stream channels, riparian zones and water quality. Site productivity of the landslide scars were probably greatly reduced. Little Tom Folly and Saddle Butte basins were hit hard by this practice. One sidecast failure off of a landing in the NW1/4 of Sec. 34, T21S, R7W touched off a debris torrent which carried material 3300 feet down a drainage and into Saddle Butte Creek blocking the 21-7-35.0 road.

Another very negative practice in the 50s and 60s was blading roads directly along the bottom of major drainages or just above the drainage where sidecast could directly enter stream channels. Skid trails and skid roads branched off from these main roads up the bottom of steep graded feeder draws. A number of debris torrents occurred in these draws. I suspect there was also a big problem with stream bank sloughage. The aerial photos of 59, 64, and 70 seem to indicate that huge amounts of sediment clogged these draws and stream channels.*

7. From 1983 to 1989 the number of landslide events both in number and volume of material significantly decreased. The drop was dramatic for road related failures. I believe the major reasons have been a decrease in the level of logging and road construction, overall better road building practices and the effects of a protracted drought. The following table (#9) for Little Tom Folly and Saddle Butte illustrate this.

* The main channels in North Tom Folly and Smith Folly were hit particularly hard. Parts of Big Tom Folly Creek might have also been hit hard.

number of events in Little Tom Folly and Saddle Butte from 5/1983 to 6/1989

	small	medium	large	total
In established Forest	∞ 4	0	0	4
Clearcut related	7	6	1 *	14
Road Related	0	3	0	3
total	11	9	1	21

percentage of these events

	small	medium	large	total
In established Forest	19	0	0	19
Clearcut related	33	29	5 *	67
Road related	0	14	0	14
total	52	43	5	100

* may prove to be road related with further investigation. ∞ all in young second growth

9. From the field I have discovered 12 new landslides since the 6/89 photos in Little Tom Folly and Saddle Butte (see folder #7). Two of them are road related. Nine are small and three medium in size.

10. The unhealed landslide scars as of 6/89 are plotted on the maps in Folder # 4 comprise a small fraction of the original areas of the slides. ~~Visible~~ Scars of slides which occurred prior to 7/64 and which are visible in the 89 photos are almost non-existent. I consider scars to be areas with exposed ground which still may be experiencing accelerated erosion.

Many landslide scars in the Tom Folly LAU have healed very quickly. Large scars can heal over completely in five or six years. In contrast to the past logging periods relatively little sedimentation seems to be originating from slope failures when viewing the LAU as a whole. Riparian areas, draw bottoms and stream channels damaged directly by slide activity, road placement*, and cat skidding, seem to have almost completely recovered from an erosion standpoint. I made no attempt to access streambed recovery and condition from a sedimentation stand-point. Erosion from unsurfaced roads and ditches where cross drainage is inadequate are the biggest source of sediment today.

Landslide Hazard Map: Slope appears to be the biggest factor affecting landslides. The slope breaks color coded on the SCS soil survey map seem to be acceptable ones from a slope stability standpoint. Low Hazard would be on slopes less than 30 percent, moderate hazard would on 30 to 60 percent slopes and high hazards would be on slopes greater than 60 percent. Refer to the table (#1) on the second page for these slope class distributions among the seven sub basins of the LAU. It was not practical to incorporate other slope stability factors into the map because of the complexities involved and because of incomplete information of where these other factors (seeps, as an example are distributed within the Tom Tolly LAU.

Potential failure at the Lookout Mountain waste disposal site located in the NE1/4SE1/4 Sec 17, T21S, R6W:

In 1990 roughly 10,000 yd^3* of stony earth (road cut material from private land) was disposed on a bench in a BLM clearcut unit just below the divide between the Smith Jolly sub basin and the South Fork of the Smith River. Tension cracks appeared in 1992 on the waste pile and the 21-6-13.0 road above. It is not known if and where the slip plane daylights downslope of the disposal site. The potential exists for a ~~significant~~ deep seated failure which would significantly impact water quality. The probability of such event happening is low to medium based on what is known presently. Steep slopes below the bench and the apparent SW dip of the strata are factors favorable for movement. No seeps were discovered downslope which might indicate the presence of a slip plane. The absence of a seep would be a factor not favoring movement.

Ten bench marks of known position and elevation were established in a transect extending from the road through the bench and down a draw below to allow us to determine if and how much future movement occurs.

* low degree of confidence in estimate

Roads: Folder # 5 contains maps with roads plotted and color coded as to their surfacing - asphalt, rock (gravelled) and dirt (natural surface). I observed in the field at least part of many of the roads. I have included roads which are effectively no longer part of any transportation system because of the degree of deterioration or extreme overgrowth of vegetation.

On the maps in Folder #6 are mapped current dirt road erosion levels in qualitative terms. The ratings for individual roads are based on my brief visual observations in the field, aerial photo and contour map interpretation and other peoples knowledge of the area. A high rating denotes extensive rilling which frequently is deeper than two inches or has deep downcutting in ditches. A low rating denotes no more than dispersed superficial rilling and sheet erosion. Low level sites are generally well vegetated and/or have effective drainage features such as waterbars.

The combination of steep grades and at least occassional vehicle traffic during wet periods produced the worse situations. Eroded out ruts are as deep as 20 inches on certain stretches of bad roads.

Dirt roads are most likely the largest source of sediment in the Tom Folly LAU today. Road cutbank erosion on all categories of roads and ditch erosion of rocked and asphalted roads are a problem over perhaps 10 percent of the total road lengths (a very rough estimation based on my fairly extensive cruising of the roads). Overall, cutbanks and ditch lines are well vegetated and many of the cutbanks still exposed seem to be fairly stable to mass wasting and erosion. One example of bad ditch erosion is the BLM 21-7-35.1 road which has no culverts over a lengthy steep grade.

Recent Disturbances and likely near future disturbances

In Folder #6 are maps giving the recent major disturbances I observed in the field which are not on the 6/89 aerial photos. Also included are several units on BLM Coos Bay District land which are old growth on the 6/89 photos but are mapped as stands 0 to 5 years of age in GIS. My intent in making the map is to provide planners with a more complete picture of cumulative impacts. The biggest mass wasting and erosion problems usually occur within seven years of disturbance based on my experience and the literature which I have read. Fresh road cutbanks in certain soils commonly experience high levels of erosion and sloughing for the first couple of years, for example. Sediment escapage from clearcuts in most instances is very little a couple of years after site preparation.* Nearly all medium and large landslides seem to occur within seven years of disturbance based on my Tom Folly analysis.

Areas mapped green are lands in my estimation which may be logged in the near future based on where the new roads and landings are located or have been flagged. The two quarter sections colored pink are lands which may soon be logged according to Al Jones in a conversation with Pete Howe.

* Exceptions can be cat logged or site prepared units, especially where bladed skid trails are present or units with inadequately waterbarred fire trails which were

Acceleration and concentration of runoff and alteration of natural drainage.

Extensive soil compaction, roads, and skid trails accelerate runoff over natural conditions. Roads and bladed skid roads capture, concentrate and redirect drainage. One negative aspect can be greatly increased delivery of water to streams during runoff periods causing problems such as stream bank erosion from higher flows. Another negative effect can be decreased ground water delivery to streams during the dry season.

Dennis Hutchison recently told me that directives could come in the future mandating that road density be decreased under certain circumstances. In light of this, I have attempted to produce a map (Folder #8) which could act as a starting point for further analysis of this subject. It was produced primarily through aerial photo interpretation and knowledge of where the latest logging and road construction activity have occurred. My intent is to have an easily devised tool for visualizing where serious problems relating to acceleration and concentration of runoff <u>may</u> occur, <u>not</u> where they are actually located, if they do exist!

On the map I've plotted the roads in the present transportation system and the more prominent roads no longer driveable in their current condition. I made no attempt on the map to determine the affects these roads have on the acceleration and concentration of runoff. In general, roads in steep terrain with their larger cuts have the greatest impact. This is especially true of those at the midslope range.

Separate from the effects of these roads, I came up with five color-coded map categories which attempt to quantify in relative terms current levels of accelerated and concentrated runoff due to logging. I took into consideration the density of those roads and trails not plotted, the method of yarding, and the elapsed time between the disturbance and now.

green: possible very low to no accelerated runoff and concentration of drainage. These include forest which have not been logged or have only been lightly salvaged.

white: possible low level of accelerated runoff and concentration of drainage. These areas include:

a. all cable yarded clearcuts older than five years.

white (continued):

b. ground with low density roads and skid trails older than five years

c. ground with moderate to high density roads and skid trails which were created more than 35 years ago.

yellow: possible moderate level of accelerated runoff and concentration of drainage. These areas include all cable yarded clearcuts younger than five years.

orange: also possible moderate level of accelerated runoff and concentration of drainage. These areas include:

a. ground with low densities of roads and skid trails created less than five years ago.

b. ground with medium to high densities of road and skid trails created 24 to 35 years ago

brown: possible high levels of accelerated runoff and concentration of drainage. These areas include ground with medium to high densities of roads and skid trails created less than 24 years ago

None of these five categories have been ground truthed. Studies have shown that compaction is long-lasting in soils of the Pacific Northwest. It can still be significant 40 years or more after disturbance. The time breaks in my categories are somewhat arbitrary. I was not able to reliably determine which lands logged over 35 years ago had ground-based activity and to determine their road and skid trail density by studying the 1989 aerial photos. Older photo coverage was too poor to fill in enough of the gaps. The 24 year break corresponds to the 1970 photos. The five year break corresponds to the 89 photos.

I considered ground to have a high road and trail density where visible roads and trails were spaced tighter than 80 feet on average. Medium density roads and trails had spacings of about 80 to 200 ft.

I only had time to do the Elkton Quadrangle sheet. If this map is found to be of value to anyone I will map the rest of the Tom Folly LAU. I can think of some definite shortcomings of my methodology as it is now developed. Some roads and skid trails (especially bladed ones) may have captured permanently the drainage of streams. In those cases, the assumption that the healing with time may move a piece of ground into a lesser impacting category may not always apply. Also, the continuing effects of mass wasting is not factored in. For example, a lengthy debris avalanche forms a channel for water removal. It also removes a lot of the soil material which effectively absorbs the water. My map may more accurately be labled acceleration and concentration of runoff directly caused by roads, skid trails and yarding trails.

Memorandum

To: Tyee Plans Forester

From: Tyee Soil Scientist

Subject: Soils Report for Tom Folly LAU Watershed Analysis

Table of Contents:

Landforms:

1. Elevations: 80 ft at the town of Elkton where Elk Creek enters the Umpqua River to 1757 ft. at the divide between the Big Tom Folly watershed and the Little South Fork of the Smith River watershed.

2. Geomorphology: Erosion of a series of synclinal anticlinal and monoclinal folds have formed enlongated basins highly dissected with generally steep sided draws. Relief is typically 1000 ft from basin bottom to ridgetop. Sloping benches are common.

3. Geologic Formation: The area is composed of Tyee sandstone and siltstone sedimentary rocks of the Coast Range Mountains. The dip of the strata is generally in a southerly direction (southwestern is most common). Dips however, occur in all directions. The strata range from being finely bedded and brittle to massive and both hard and brittle. A common arrangement is thick, massive sandstone strata alternating with thinner, finely bedded siltstones and fine sandstone layers which are soft, brittle and highly fractured. The massive sandstone may have vertical joints with spacings of two feet or more.

4. Slopes: The distribution of slope classes in the Tom Folly LAU is given in the table below. A little over half of the area is in slopes steeper than 60 percent. The 60 to 90 percent slope class includes slopes greater than 90 percent but they are considered to be of relatively small extent. See soils map (#) for slope class distribution.

Table # 1

	< 30% slope		**30-60% slope**		**60-90% slope**		
	% of area	**acres**	**% of area**	**acres**	**% of area**	**acres**	**total acres**
Little Tom	20	942	30	1413	50	2355	4709
Saddle Butte	22	340	33	511	45	696	1547
Lower Tom	38	1010	25	665	37	983	2658
North Fork	5	167	17	566	78	2599	3336
Big Tom	24	787	36	1180	40	1311	3278
Smith Folley	3	63	30	629	67	1405	2097
Folley Head	18	455	27	683	55	1390	2528
Tom Folly LAU	19	3764	28	5647	53	10739	20148

Soils: The following information was collected from the Soil Conservation Service Douglas County Survey.

1. All of LAU occurs within the western hemlock vegetation zone. This zone borders the drier grand fir/salal zone along the ridgeline of Tom Folly Mountain in the SE corner of the LAU.

2. Two soil moisture regimes occur within LAU. The moist xeric occurs in the SW corner of the LAU occupying about 10% of its area. The moist xeric soils are completely dry for 45 to 60 consecutive days in the dry season. Precipitation is about 50 to 55 inches per year. The wetter Udic soils are completely dry for less than 45 consecutive days during the dry season. Site index information seems to suggest that the Udic soils are slightly more productive than their equivalent xeric soils within the LAU (see tables 6 and 7). I would predict that the lower elevation south facing slopes in the Udic zone are Xeric.

3. All soil depths from shallow (10 to 20 inches to bedrock) to very deep (greater than 60 inches) are well represented within the LAU. The shallow soils tend to be very gravelly, loamy, occur over hard bedrock and occupy the steeper slopes. Site index information show that the shallow soils are significantly less productive than the moderately deep soils (20 to 40 inches to generally soft sandstone and siltstone bedrock). The moderately deep soils only seem to be slightly less productive than their deeper equivalents. (See tables 6 and 7).

4. About one third of the LAU is covered by soil mapping units which have shallow soils as a major component. Within these soil mapping units (233G, 237G, 240G, 437F and 437G) shallow soils occupy 25 to 35% of the total area.

Breakdown by sub basin of the percent area occupied by these mapping units containing shallow soils as a major component:

Little Tom	40%	1900 acres
Saddle Butte	15%	230 acres
Lower Tom	25%	670 acres
North Fork	60%	2000 acres
Smith Folly	25%	520 acres
Folly Head	15%	380 acres
Total FAU	32%	6500 acres

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5. Soils with clayey subsoils are in the 209C, 209E, 211E, 305E, 310E, and 310F soil mapping units. These soils are on slopes less that 60 percent. They dominate many areas with slopes less than 30 percent. Clayey soils retain more water and hold it longer than other soils. The window of opportunity for doing projects on them during the dry season is consequently less. Their porosity and structure are easily susceptible to severe damage from compaction and puddling when wet.

6. Soil mapping units 19A through 71A are nearly level floodplain soils of the major creeks. They were only mapped out on parts of Elk and Big Tom Folly Creeks. They occur elsewhere as small inclusions of other mapping units. Soil drainage ranges from somewhat excessively to poorly drained with high water tables. Their acreage extent is small.

7. Soil mapping units 209C to 437G are upland soils which are dominantly well drained. Rock outcrop as a major component occupies the 237G, 437F and 437G mapping units. 237G, 437F and 437G also contain shallow soils as a major component.

<u>Soil Mapping Units in Tom Folly LAU</u>
see included Soils Map

19A = Kirkendall-Nekoma complex, 0 to 3% slopes

21A = Quosatana silt loam, 0 to 3% slopes

25A = Evans loam, 0 to 3% slopes

27A = Chapman-Chehalis complex, 0 to 3% slopes

35A = Newberg fine sandy loam, 0 to 3% slopes

45A = Newberg loamy sand, 0 to 3% slopes

61A = Roseburg loam, 0 to 3% slopes

71A = Sibold fine sandy loam, 0 to 5% slopes

209C = Windygap silt loam, 2 to 12% slopes

209E = Windygap silt loam, 12 to 30% slopes

211E = Windygap-Bellpine complex, 12 to 30% slopes

225F = Bateman silt loam, 30 to 60% slopes **& 225E 12 to 30% slopes**

233G = Atring-Larmine complex, 60 to 90% slopes

237G = Atring-Larmine-Rock outcrop complex, 60 to 90% slopes

240G = Digger-Bohannon-Umpcoos complex, 60 to 90% slopes

270F = Rosehaven loam, 30 to 60% slopes

275G = Littlesand-Rosehaven-Atring complex, 60 to 90% slopes **& 275F 30 to 60% slopes**

305E = Honeygrove gravelly clay loam, 3 to 30% slopes

310E = Honeygrove-Peavine complex, 3 to 30% slopes

310F = Honeygrove-Peavine complex, 30 to 60% slopes

311E = Preacher-Bohannon complex, 3 to 30% slopes

311F = Preacher-Bohannon-Xanadu complex, 30 to 60% slopes

325E = Orford gravelly silt loam, 3 to 30% slopes

325F = Orford gravelly silt loam, 30 to 60% slopes

350G = Preacher-Bohannon-Digger complex, 60 to 90% slopes

370E = Fernhaven gravelly loam, 3 to 30% slopes

370F = Fernhaven gravelly loam, 30 to 50% slopes

375F = Fernhaven-Digger complex, 30 to 60% slopes

376G = Digger-Preacher complex, 60 to 90% slopes

377E = Xanadu gravelly loam, 3 to 30% slopes

437F = Digger-Umpcoos-Rock outcrop complex, 30 to 60% slopes

437G = Digger-Umpcoos-Rock outcrop complex, 60 to 90% slopes

Soil Series Characteristics
Table 2

							Doug Fir Site Index	
Soil Series	Soil Depth*	Surface Texture	Subsurface Texture	Available water capacity 20" to 60"	Soil Temp. Regime	Soil Moisture Regime	50 Year King	100 year McCardle
Atring	MD to soft ss	Gr loam	GRV loam	2.4/3.0	Mesic	45-60dry Xeric	98	126
Bateman	VD	Silt loam	Silty Clay loam	4.0/10.5	Mesic	45-60dryXeric	118	153
Bellpine	MD to soft ss+sis	Silt loam	Silty clay	3.6/4.5	Mesic	45-60dry Xeric	111	146
Bohannon	MD to soft ss	Gr loam	GR loam	2.0/4.0	Mesic	Udic	113	154
Chapman	Very Deep	loam	loam	3.4/10.0	Mesic	xeric	120	---
Chehalis	Very Deep	Silt loam	silty clay loam	4.0/11.0	Mesic	xeric	130	---
Digger	MD to soft ss	GRV loam	GRV loam	2.0/3.5	Mesic	udic	111	150
Evons	Very Deep	loam	F+VFSL	3.4/11.0	Mesic	xeric	---	--
Fernhaven	VD to ss + sis	Gr loam	clay loam	3.0/11.5	Mesic	udic	120	162
Honeygrove	VD to ss,sis + volcanic	Gr CL	clay	3.6/9.0	Mesic	udic	116	158
Kirkendall	VeryDeep	Silt loam	silty clay loam	4.0/11.0	Mesic	udic	122	---
Larmine	Sh to hard ss	Gr loam	GRV loam	1.8/1.8	Mesic	45-60dry xeric	82	112
Littlesand	MD to soft ss	Gr loam	Gr+Cob CL	3.0/4.0	Mesic	xeric	112	144
Nekoma	Very Deep	Silt loam	VFSL+FS	4.0/8.0	Mesic	udic	140	---
Newberg	Very Deep	FSL+LS	FSL,LFS,S	2.2-2.8/6.0-7.0	Mesic	xeric	112	---
Orford	VD to ss + sis	Gr sil	SiCl,Clay	3.5/9.0	Mesic	udic	125	165
Peavine	MD to soft ss,sis,volcanic	SiCL	clay	3.3/4.5	Mesic	udic	110	147
Preacher	VD to ss	loam	loam+CL	4.0/10.5	Mesic	udic	121	164
Quosatana	Very Deep	Silt loam	Si CL+SiC	4.0/12.0	Mesic	xeric	---	---
Roseburg	Very Deep	loam	CL+L	2.7/10.0	Mesic	xeric	---	---
Rosehaven	Very Deep ss+sis	loam	Clay loam	3.6/11.0	Mesic	60-90dry xeric	115	148
Sibold	Very Deep	fine sandy loam	loam+SiC	3.2/10.0	Mesic	xeric	---	---
Umpcoos	Sh to hard ss	GRV SL	GRV SL	1.4/1.4	Mesic	udic45-60dry	61	79
Windygap	Deep to soft ss + sis	Silt Loam	Silty clay	3.5/10.5	Mesic	xeric	118	153
Xanadu	VD to ss – sis	GR loam	CL+clay	3.2/9.5	Mesic	udic	111	144

ss = sandstone   sis – siltstone

TABLE #3		
Mapping Unit	Surface Textures	Subsoil Textures
19A	silt loam	silty clay loam & very fine sandy loan
21A	silt loam	silty clay loam & silty clay
25A	loam	fine & very fine sandy loam
27A	loam, silt loam	loam, silty clay loam
35A	fine sandy loam	fine sandy loam, loamy fine sand
45A	loamy sand	fine sandy loam, fine sand
61A	loam	clay loam & loam
71A	fine sandy loam	loam & silty clay
209C	silt loam	silty clay
209E	silt loam	silty clay
211E	silt loam	silty clay
225F	silt loam	silty clay loam
233G	gravelly loam	very gravelly loam
237G	gravelly loam	very gravelly loam
240G	gravelly & very gravelly loam	gravelly & very gravelly loam
270F	loam	clay loam
275G	gravelly loam, loam	very gravelly clay loam, clay loam
305E	gravelly clay loam	clay
310E	gravelly clay loam, silty clay loam	clay
310F	gravelly clay loam, silty clay loam	clay
311E	loam, gravelly loam	loam, clay loam, gr loam
311F	loam, gravelly loam	loam, clay loam, gr loam
325E	gravelly silt loam	silty clay loam, clay
325F	gravelly silt loam	silty clay loam, clay
350G	loam, gravelly & very gr loam	loam, clay loam, very gr loam
370E	gravelly loam	clay loam
370F	gravelly loam	clay loam
375F	gravelly, very gr loam	clay loam, very gravelly loam
376G	very gravelly loam, loam	very gr loam, loam, clay loam
377E	gravelly loam	clay loam, clay
437F	very gr loam, very gr sandy loam	very gr loam, very gr sandy loam
437G	very gr loam, very gr sandy loam	very gr loam, very gr sandy loam

TABLE #4					
Soil Mapping Unit	Soil Depth	Available Water		Soil Moisture Regime	(Douglas Fir) 50 Year SI (King)
		to 20"	to 60"		
19A	Very Deep	4.0"	8.0 to 11.0"	Udic	122-140
21A	Very Deep	4.0	12.0	Xeric	none
25A	Very Deep	3.4	11.0	Xeric	none
27A	Very Deep	3.4	10.0 to 11.0	Xeric	120-130
35A	Very Deep	2.8	7.0	Xeric	112
45A	Very Deep	2.2	6.0	Xeric	< 112
61A	Very Deep	2.7	10.0	Xeric	none
71A	Very Deep	3.2	10.0	Xeric	none
209C	Deep	3.5	10.5	Xeric	118
209E	Deep	3.5	10.5	Xeric	118
211E	Mod. Deep to Deep	3.5	4.5 to 10.5	Xeric	111-118
225F	Very Deep	4.0	10.5	Xeric	118
233G	Shallow to Mod. Deep	1.8 to 2.4	1.8 to 3.0	Xeric	82-98
237G*	Shallow to Mod. Deep	1.8 to 2.4	1.8 to 3.0	Xeric	82-98
240G	Shallow to Mod. Deep	1.4 to 2.0	1.4 to 4.0	Udic	61-113
270F	Very Deep	3.6	11.0	Xeric	113
275G	Mod. Deep to Very Deep	2.4 to 3.6	3.0 to 11.0	Xeric	98-117
305E	Very Deep	3.6	9.0	Udic	116
310E	Mod. Deep to Very Deep	3.3 to 3.6	4.5 to 9.0	Udic	110-116
310F	Mod. Deep to Very Deep	3.3 to 3.6	4.5 to 9.0	Udic	110-116
311E	Mod. Deep to Very Deep	2.0 to 4.0	4.0 to 10.5	Udic	113-121
311F	Mod. Deep to Very Deep	2.0 to 4.0	3.2 to 10.5	Udic	111-113
325E	Very Deep	3.5	9.0	Udic	125
325F	Very Deep	3.5	9.0	Udic	125
350G	Mod. Deep to Very Deep	2.0 to 4.0	3.5 to 10.5	Udic	111-121
370E	Very Deep	3.0	11.5	Udic	120
370F	Very Deep	3.0	11.5	Udic	120
375F	Mod. Deep to Very Deep	2.0 to 3.0	3.5 to 11.5	Udic	111-120
376G	Mod. Deep to Very Deep	2.0 to 4.0	3.5 to 10.5	Udic	111-121
377E	Very Deep	3.2	9.5	Udic	111
437F	Shallow to Mod. Deep	1.4 to 2.0	1.4 to 3.5	Udic	61-111
437G	Shallow to Mod. Deep	1.4 to 2.0	1.4 to 3.5	Udic	61-111

Soil Mapping Units: A = 0 to 3 percent slopes
C = 2 to 12 percent slopes
E = 12 to 30 percent slopes
F = 30 to 60 percent slopes
G = 60 to 90 percent slopes

Soil Depth: Shallow = 10 to 20 inches to bedrock
Mod (Moderately) Deep = 20 to 40 inches to bedrock
Deep = 40 to 60 inches to bedrock
Very Deep = greater than 60 inches to bedrock

Available Water to 60 inches:
- less than 2.5 inches = very low
- 2.5 to 5.0 inches = low
- 5.0 to 7.5 inches = moderate
- 7.5 to 10.0 inches = high
- greater than 10.0 inches = very high

Available Water to 20 inches:
- less than 2.0 inches = low
- 2.0 to 3.0 inches = moderate
- 3.0 to 4.0 inches = high

Soil Moisture Regime:

Xeric: The soil profile is completely dry for 45 to 60 consecutive days during the dry season for most years.

Udic: The soil profile is completely dry for less than 45 consecutive days during the dry season.

Table # 6

Upland Soils
Douglas Fir 100 Year Index (McCardle)

Depth	Shallow	Shallow	Mod Deep	Mod Deep	Deep-Very Deep	Deep - Very Deep
Soil Moisture	Xeric	Udic	Xeric	Udic	Xeric	Udic
Atring			126			
Bateman					153	
Bellpine			146			
Bohannon				154		
Digger				150		
Fernhaven						162
Honeygrove						158
Larmine	112					
Littlesand			144			
Orford						165
Peavine				147		
Preacher						164
Rosehaven					148	
Umpcoos		79				
Windygap					153	
Xanadu						149
Average	112	79	139	150	151	160

Table # 7

Upland Soils
Douglas Fir 50 Year Site Index (King)

Depth	Shallow	Shallow	Mod Deep	Mod Deep	Deep-Very Deep	Deep - Very Deep
Soil Moisture	Xeric	Udic	Xeric	Udic	Xeric	Udic
Atring			98			
Bateman					118	
Bellpine			111			
Bohannon				113		
Digger				111		
Fernhaven						120
Honeygrove						116
Larmine	82					
Littlesand			112			
Orford						125
Peavine				110		
Preacher						121
Rosehaven					115	
Umpcoos		61				
Windygap					118	
Xanadu						111
Average	82	61	107	111	117	119

Slope Stability: To get an idea of the extent of the slope instability problem in the Tom Folly LAU and what are the management implications, I made a series of maps on copies of the Elkton and Putnam Valley 7 1/2 minute quad sheets.

On one set of maps (Folder #2) I plotted landslide events from the aerial photos we have on file from 1959 to 1989. They are color coded to their period of occurrence. There were quite a few missing photos from the 59, 64, 70 and 78 sets. This is especially true of the 59 set. Consequently, I likely under recorded the number of events readily discernable from aerial photographs. A number of small events which went undetected probably exist under dense old-growth canopies.

On the set in Folder #3 I color coded the events according to the likely underlying management cause (roads or clearcuts) or lack of management causes (undisturbed forest or logged land with reestablished trees of at least 20 years of age).

On the set in Folder #4 I plotted the unhealed landslide scars which remained on the landscape and which may have still been eroding when the 89 photos were taken.

In folder #4 I plotted from field observations landslides which occurred after 89 photos were taken.

I observed many of the larger landslides from the 50's period to present in the field. I took down information such as strike and dips of the strata, the presence or absence of seeps, and road drainage in trying to discern the main causes.

Slope Stability Findings:

1. A large number of landslide events occurred over the past 40 years. Nearly all of the observable events from the aerial photographs are debris avalanches, flows and torrents. Only a small percentage of them are deep-seated slumps.

2. In this report I am arbitrarily calling slides covering less than 0.1 acres as small, 0.1 to 0.5 acres as medium and greater then 0.5 acres as large. Many of the larger slides are a combination debris avalanche, debris flow and debris torrent. Table #8 gives the size distributions in the Little Tom Folly and Saddle Butte subbasins.

   Nearly all of the large events have been road related. Large events in undisturbed forest are apparently infrequent and widely spaced. Only two have occurred in the Tom Folly LAU over the last 40 years (debris torrents in Little Tom Folly and Smith Folly). There could be quite a few small events in undisturbed forest which are not detectable from aerial photographs.

   Over the past 40 years road related slides have been the most frequent and by far compose the largest volume of material moved. Over the past decade volume and numbers of these slides have decreased dramatically (discussed later in report).

TABLE #8	early 1950s to 6/1989 number of events in Little Tom Folly and Saddle Butte			
	small	medium	large	total
In (undisturbed) established Forest	4	0	1	5
Clearcut related	40	35	2*	77
Road related	26	51	27	104
Total	70	86	30	186

	early 1950s to 6/1989 percentage of events in Little Tom Folly and Saddle Butte			
	small	medium	large	total
In (undisturbed) established Forest	3	0	<1	3
Clearcut related	21	19	1	41
Road related	14	27	15	56
Total	38	46	16	100

small = < 0.1 acres
medium = 0.1 to 0.5 acres
large = greater than 0.5 acres

* One of the two large clearcut related events might have been caused by channeled flow off a landing and therefore more accurately road related according to Dave Clark who recently visited the site.

3. The majority of road related failures have been debris avalanches resulting from overloading slopes with cut sidecast. Debris torrents resulting from concentrations of drainage by road have been pretty common and have originated most frequently at headwalls. A small percentage of the road related failures large enough to detect from aerial photographs have been cutslope failures. One cutslope failure at the head of the North Fork of Tom Folly touched off a large sidecast failure.

4. There does not seem to be a very good correlation between strike and dip of rock strata and slope failures although I suspect strike and dip are probably contributing factors in some of the failures.

5. There seems to be a pretty good correlation between shallow soils over hard bedrock and large sidecast failures.

6. There is a definite historical pattern associated with the failures which have occurred in the Tom Folly LAU. From the 50's to about 1980 a lot of major road construction occurred and sidecasting large amounts of material on steep sideslopes appears to ~~be~~ have been a common practice resulting in many medium to large debris avalanches and debris torrents, which very negatively impacted stream channels, riparian zones and water quality. Site productivity of the landslide scars were probably greatly reduced. Little Tom Folly and Saddle Butte basins were hit hard by this practice. One sidecast failure off of a landing in the NW1/4 of Sec. 34, T. 21 S., R. 7 W., touched off a debris torrent which carried material 3300 feet down a drainage and into Saddle Butte Creek blocking the 21-7-35.0 Road.

   Another very negative practice in the 50's and 60's was blading roads directly along the bottom of major drainages or just above the drainage where sidecast could directly enter stream channels. Skid trails and skid roads branched off from these main roads up the bottom of steep graded feeder draws. A number of debris torrents occurred in these draws. I suspect there was also a big problem with stream bank sloughage. The aerial photos of 59, 64, and 70 seem to indicate that huge amounts of sediment clogged these draws and stream channels.*

7. From 1983 to 1989 the number of landslide events both in number and volume of material significantly decreased. The drop was dramatic for road related failures. I believe the major reasons have been a decrease in the level of logging and road construction, overall better road building practices and the effects of a protracted drought. The following table (#9) for Little Tom Folly and Saddle Butte illustrate this.

   * The main channels in North Tom Folly and Smith Folly were hit particularly hard. Parts of Big Tom Folly Creek might have also been hit hard.

	number of events in Little Tom Folly and Saddle Butte from 5/1983 to 6/1989			
	small	medium	large	total
In established Forest	~ 4	0	0	4
Clearcut related	7	6	1*	14
Road related	0	3	0	3
Total	11	9	1	21

	percentage of these events			
	small	medium	large	total
In established Forest	19	0	0	19
Clearcut related	33	29	5*	67
Road related	0	14	0	14
Total	52	43	5	100

* may prove to be road related with further investigation. ~ all in young second growth

9. *From the field I have discovered 12 new landslides since the 6/89 photos in Little Tom* Folly and Saddle Butte (see folder #7). Two of them are road related. Nine are small and three medium in size.

10. The unhealed landslide scars as of 6/89 are plotted on the maps in Folder #4 comprise a small fraction of the original areas of the slides. Scars of slides which occurred prior to 7/64 and which are visible in the 89 photos are almost non-existent. I consider scars to be areas with exposed ground which still may be experiencing accelerated erosion.

    Many landslide scars in the Tom Folly LAU have healed very quickly. Large scars can heal over completely in five or six years. In contrast to the past logging periods relatively little sedimentation seems to be originating from slope failures when viewing the LAU as a whole. Riparian areas, draw bottoms and stream channels damaged directly by slide activity, road placement*, and cat skidding seem to have almost completely recovered from an erosion standpoint. I made no attempt to access streambed recovery and condition from a sedimentation standpoint. Erosion from unsurfaced roads and ditches where cross drainage is inadequate are the biggest source of sediment today.

Landslide Hazard Map: Slope appears to be the biggest factor affecting landslides. The slope breaks color coded on the SCS soil survey map seem to be acceptable ones from a slope stability standpoint. Low hazard would be on slopes less than 30 percent, moderate hazard would be on 30 to 60 percent slopes and high hazards would be on slopes greater than 60 percent. Refer to the table (#1) on the second page for these slope class distributions among the seven subbasins of the LAU. It was not practical to incorporate other slope stability factors into the map because of the complexities involved and because of incomplete information of where these other factors (seeps, as an example) are distributed within the Tom Folly LAU.

Potential failure at the Lookout Mountain waste disposal site located in the NE1/4SE1/4 Sec. 17, T. 21 S., R. 6 W.:

In 1990 roughly 10,000 yd^3 * of stony earth (road cut material from private land) was disposed on a bench in a BLM clearcut unit just below the divide between the Smith Folly sub basin and the South Fork of the Smith River. Tension cracks appeared in 1992 on the waste pile and the 21-6-13.0 Road above. It is not known if and where the slip plane daylights downslope of the disposal site. The potential exists for a deep seated failure which would significantly impact water quality. The probability of such event happening is low to medium based on what is known presently. Steep slopes below the bench and the apparent SW dip of the strata are factors favorable for movement. No seeps were discovered downslope which might indicate the presence of a slip plane. The absence of a seep would be a factor not favoring movement.

Ten bench marks of known position and elevation were established in a transect extending from the road through the bench and down a draw below to allow us to determine if and how much future movement occurs.

* low degree of confidence in estimate

Roads: Folder #5 contains maps with roads plotted and color coded as to their surfacing - asphalt, rock (graveled) and dirt (natural surface). I observed in the field at least part of many of the roads. I have included roads which are effectively no longer part of any transportation system because of the degree of deterioration or extreme overgrowth of vegetation.

On the maps in Folder #6 are mapped current dirt road erosion levels in qualitative terms. The ratings for individual roads are based on my brief visual observations in the field, aerial photo and contour map interpretation and other people's knowledge of the area. A high rating denotes extensive rilling which frequently is deeper than two inches or has deep downcutting in ditches. A low rating denotes no more than dispersed superficial rilling and sheet erosion. Low level sites are generally well vegetated and/or have effective drainage features such as waterbars.

The combination of steep grades and at least occasional vehicle traffic during wet periods produced the worse situations. Eroded out ruts are as deep as 20 inches on certain stretches of bad roads.

Dirt roads are most likely the largest source of sediment in the Tom Folly LAU today. Road cutbank erosion on all categories of roads and ditch erosion of rocked and asphalted roads are a problem over perhaps 10 percent of the total road lengths (a very rough estimation based on my fairly extensive cruising of the roads). Overall, cutbanks and ditch lines are well vegetated and many of the cutbanks still exposed seem to be fairly stable to mass wasting and erosion. One example of bad ditch erosion is the BLM 21-7-35.1 Road which has no culverts over a lengthy steep grade.

Recent Disturbances and likely near future disturbances

In Folder #6 are maps giving the recent major disturbances I observed in the field which are not on the 6/89 aerial photos. Also included are several units on BLM Coos Bay District land which are old growth on the 6/89 photos but are mapped as stands 0 to 5 years of age in GIS. My intent in making the map is to provide planners with a more complete picture of cumulative impacts. The biggest mass wasting and erosion problems usually occur within seven years of disturbance based on my experience and the literature which I have read. Fresh road cutbanks in certain soils commonly experience high levels of erosion and sloughing for the first couple of years, for example. Sediment escapage from clearcuts in most instances is very little a couple of years after site preparation.* Nearly all medium and large landslides seem to occur within seven years of disturbance based on my Tom Folly analysis.

Areas mapped green are lands in my estimation which may be logged in the near future based on where the new roads and landings are located or have been flagged. The two quarter sections colored pink are lands which may soon be logged according to A U Jones in a conversation with Pete Howe.

* Exceptions can be cat logged or site prepared units, especially where bladed skid trails are present or units with inadequately waterbarred fire trails which were cat bladed.

Acceleration and concentration of runoff and alteration of natural drainage.

Extensive soil compaction, roads, and skid trails accelerate runoff over natural conditions. Roads and bladed skid roads capture, concentrate and redirect drainage. One negative aspect can be greatly increased delivery of water to streams during runoff periods causing problems such as stream bank erosion from higher flows. Another negative effect can be decreased ground water delivery to streams during the dry season.

Dennis Hutchison recently told me that directives could come in the future mandating that road density be decreased under certain circumstances. In light of this, I have attempted to produce a map (Folder #8) which could act as a starting point for further analysis of this subject. It was produced primarily through aerial photo interpretation and knowledge of where the latest logging and road construction activity have occurred. My intent is to have an easily devised tool for visualizing where serious problems relating to acceleration and concentration of runoff may occur, not where they are actually located, if they do exist!

On the map I've plotted the roads in the present transportation system and the more prominent roads no longer driveable in their current condition. I made no attempt on the map to determine the affects these roads have on the acceleration and concentration of runoff. In general, roads in steep terrain with their larger cuts have the greatest impact. This is especially true of those at the midslope range.

Separate from the effects of these roads, I came up with five color-coded map categories which attempt to quantify in relative terms current levels of accelerated and concentrated runoff due to logging. I took into consideration the density of those roads and trails not plotted, the method of yarding, and the elapsed time between the disturbance and now.

green: possible very low to no accelerated runoff and concentration of drainage. These include forest which have not been logged or have only been lightly salvaged.

white: possible low level of accelerated runoff and concentration of drainage. These areas include:

a. all cable yarded clearcuts older than five years.

b. ground with low density roads and skid trails older than five years.

c. ground with moderate to high density roads and skid trails which were created more than 35 years ago.

yellow: possible moderate level of accelerated runoff and concentration of drainage. These areas include all cable yarded clearcuts younger than five years.

orange: also possible moderate level of accelerated runoff and concentration of drainage. These areas include:

a. ground with low densities of roads and skid trails created less than five years ago.

b. ground with medium to high densities of road and skid trails created 24 to 35 years ago.

brown: possible high levels of accelerated runoff and concentration of drainage. These areas include ground with medium to high densities of roads and skid trails created less than 24 years ago.

None of these five categories have been ground truthed. Studies have shown that compaction is long-lasting in soils of the Pacific Northwest. It can still be significant 40 years or more after disturbance. The time breaks in my categories are somewhat arbitrary. I was not able to reliably determine which lands logged over 36 years ago had ground-based activity and to determine their road and skid trail density by studying the 1989 aerial photos. Older photo coverage was too poor to fill in enough of the gaps. The 24 year break corresponds to the 1970 photos. The five year break corresponds to the 89 photos.

I considered ground to have a high road and trail density where visible roads and trails were spaced tighter than 80 feet on average. Medium density roads and trails had spacings of about 80 to 200 ft.

I only had time to do the Elkton Quadrangle sheet. If this map is found to be of value to anyone I will map the rest of the Tom Folly LAU. I can think of some definite shortcomings of my methodology as it is now developed. Some roads and skid trails (especially bladed ones) may have captured permanently the drainage of streams. In those cases, the assumption that the healing with time may move a piece of ground into a lesser impacting category may not always apply. Also, the continuing effects of mass wasting is not factored in. For example, a lengthy debris avalanche forms a channel for water removal. It also removes a lot of the soil material which effectively absorbs the water. My map may more accurately be labeled acceleration and concentration of runoff directly caused by roads, skid trails and yarding trails.

Fire & Fuels Mgmt

I.C. CLIMATE

THE TOM FOLLEY LANDSCAPE ANALYSIS UNIT (LAU) HAS A TEMPERATE CLIMATE, WITH MODERATELY WARM SUMMERS AND WET MILD WINTERS. MODERATELY HIGH PRECIPITATION LEVELS ARE CHARACTERISTIC OF THIS AREA. THE SEASONAL DISTRIBUTION OF THE PRECIPITATION IS INFLUENCED BY BOTH TOPOGRAPHY AND THE CLOSE PROXIMITY OF THE PACIFIC OCEAN. THE AVERAGE ANNUAL RAINFALL AS MEASURED IN DRAIN, OREGON IS 47.74 INCHES PER YEAR, IN CLOSE BY ELKTON, IT MEASURES 52.03 INCHES. PRECIPITATION IS WINTER CONCENTRATED, WITH ABOUT 60% OCCURRING DURING THE NOVEMBER THROUGH FEBRUARY STORM SEASON.

SUMMER PRECIPITATION IS LIMITED TO OCCASIONAL LIGHT RAINSTORMS AND THUNDERSTORMS. THUNDERSTORMS CAN PRODUCE SIGNIFICANT AMOUNTS OF RAIN OVER LOCALIZED AREAS AND SOME LIGHTING WHICH CAN START FIRES. BECAUSE OF THE GENERAL LOW ELEVATION OF THE UNIT, SNOWFALL IS USUALLY SHORT-LIVED.

THE AREA'S TEMPERATURE PATTERNS ARE AFFECTED BY ELEVATION, ASPECT, AND THE LOCAL WIND PATTERNS. SEASONAL TEMPERATURE VARIATIONS ON AVERAGE ARE NOT LARGE. MEAN MAXIMUM TEMPERATURE AT ELKTON, OREGON DURING THE SUMMERS IS 84.3 DEGREES F., WITH TEMPS OVER 100 DEGREES F. NOT UNCOMMON. THE NORMAL MINIMUM JANUARY TEMPERATURE IS 35.9 DEGREES F. SOME FREEZING PERIODS OF SHORT DURATION NORMALLY OCCUR EVERY YEAR. THESE STATISTICS WERE COMPILED BY THE OSU CLIMATOLOGICAL CENTER IN CORVALLIS, OREGON.

DETAILED INFORMATION OF LOCAL AIR AND WIND CIRCULATION PATTERNS IS NOT READILY AVAILABLE. LOCAL TOPOGRAPHY HAS STRONG INFLUENCES ON WIND FLOW. PREVAILING SUMMER WINDS ARE FROM THE NORTHWEST BECAUSE EXTENSIVE HIGH PRESSURE SYSTEMS DOMINATE THE AREA. WIND INTENSITIES ARE USUALLY LOW (10 MPH) AND GUSTY DAYS ARE INFREQUENT.

WESTERLY WINDS OF 10 TO 30 MPH ARE COMMON IN THE WINTER. DURING THE APPROACH OF WEATHER FRONTS, WIND DIRECTIONS ARE FROM THE SOUTH AND SOUTHWEST. MAJOR WINTER STORMS CAN ALSO ENTER FROM THE NORTHWEST.

THE GROWING SEASON IN MOST OF THE LOCAL VALLEY AREAS IS FROM APRIL TO OCTOBER, A PERIOD OF APPROXIMATELY 120 DAYS. THIS SEASON IS HIGHLY VARIABLE, DEPENDING ON ELEVATION.

II.G.1 Fire

Fire has been the major disturbance factor to the landscape and has played an important role in the development of the existing plant communities within the Landscape Analysis Unit (LAU). This portion of the Oregon Coast Range Province is dominated by forests of Douglas-fir, western hemlock and western red cedar. Prior to the advent of fire suppression, this area was subject to relatively infrequent but very large fires, especially in the 1800's and 1900's (final SEIS). Because wildfire often killed only some of the trees in a forest, natural stands are frequently characterized by uneven-aged trees that survived at least one fire event. These events opened up the tree canopy, after which younger trees would fill in the understory. As a result, many of the remaining natural forests consist of a mosaic of mature stands, remnant patches of old-growth trees, and younger even aged conifer stands that resulted from stand replacement fires.

Today the landscape is very fragmented as a result of past wildfire and a century of logging. Recent clearcuts, thinned stands, and young plantations are interspersed with the remaining uncut mature and old growth stands. Eighty years of fire suppression has left logging and harvesting as the major disturbance factors effecting the LAU.

II.G.2 Fire History

Much of the current evidence available (fire history maps, old forest type maps, fire scar information) indicate that very large and sometimes highly intense wildfire burned over portions of the Tom Folley LAU during the early 1800's and 1900's. A recent field survey of one of the burned areas identified on the 1914 map confirmed that the fire did burn through the LAU 85-90 years ago. Tree cross sections from stumps show evidence of fire scarring supporting this fire activity.

Fire frequency and fire return intervals vary between areas depending on stand characteristics, weather, and topography. Within the LAU it appears that fires were rather infrequent, could burn with great intensity, but were not necessarily stand replacement fires. Instead, they are characterized by a patchwork pattern of areas with complete crown kill mixed with areas of low intensity underburns that kill the occasional tree or create small openings in the canopy.

Evidence of low severity burns are observed in nearly every mature stand. While fire frequencies can vary a great deal over a landscape, it appears that a fire return interval for this LAU was probably on the order of 150 years (Agee 1993). This area is considered to have a fire regime that has a long return interval with crowning fires and severe surface fires in combinations. The severity and intensity of fires will vary greatly over the landscape.

Lightning is the most common source of ignition in these forests. Large wildfires can be expected during the hot, dry summer months. This area receives very little rainfall in the summer months (July-September). According to the OSU Climate Center less than 6% of annual precipitation occurs during the summer in this area. Lightning activity levels are also increased during this time. Fires began in mid-summer and continued to burn until fall rains extinguished them.

Native American burning probably had little impact on the landscape in this LAU. According to Henry T. Lewis in <u>Reconstructing Patterns of Indian Burning in Southwestern Oregon</u> "relatively small areas of grasslands within the coastal, temperate forest areas would have been burned". Further he states "...the understory areas of temperate rainforests were left unburned except for the relatively rare incidence of lightning fires and those that may have occasionally escaped the prescribed burns set by Indians or from lightning fires that occurred during extended dry periods or droughts".

This would further lead me to believe that the fire regime in this moist, coastal province is characterized by medium to high intensity fires with fire return intervals of up to 150 years. According to local Douglas Forest Protective records, no wildfire over 20 acres in size have occurred in the LAU since 1981.

Aerial photos taken in 1959 give us an idea of how the landscape appeared prior to intensive logging and road building. There are large contiguous blocks of old growth forests on BLM lands, and to a lesser degree on private lands. These photos also show portions of the area as a distinct mosaic of scattered old growth trees overtopping or adjacent to younger conifer stands. This represents the impact of previous wildfire events. More mature stands of timber are present on the north slopes and in the riparian areas, indicating fire didn't enter these stands or burned at much lower intensities.

II.G.3 **Fuels Management.**

Fuels management is the planned manipulation and/or reduction of living or dead fuels for forest management and other land-use objectives (J. D. Walstad et al, 1990.) Fuels treatments can include prescribed burning, mechanical treatments (piling, chipping, or crushing) chemical treatments (herbicides), and increased utilization (whole tree yarding and yarding unmerchantable material). The preferred treatment has been prescribed burning of the activity fuels created by logging. Fuels management of natural fuels rarely occurs in the LAU. This may change in the future as the BLM considers the use of fire for restoring and maintaining ecological processes in our late successional reserve forests.

Historically, slash burning has been used to reduce fire hazard from slash left after logging. Western Oregon experienced several disastrous wildfires in 1902 and regulations were soon adopted to make management of activity fuels a requirement for landowners. Since burning was the most practical method for dealing with the high fuel loadings of slash typical of old-growth Douglas-fir clearcuts, the practice of slash burning was instituted in the area (Agee 1989).

During the last 80 years both government and industry lands in the LAU were commonly burned after clearcutting as the preferred method to reduce the fuels hazard and to prepare the site for planting. This practice continued right through the late 1980's. In the decade of the 80's many acres were burned to dispose slash as the harvesting of timber in the LAU increased. At the same time smoke management and environmental restraints made it more difficult to find an "open window" where burning would be permitted. Some units that had low slash fuel loadings or could not be burned safely were left untreated. However, very few alternate treatments other than machine or hand piling were used.

During the last five years higher utilization standards as well as whole tree yarding of smaller merchantable material has reduced the amount of slash left on harvest units. Due to court injunctions, fewer acres of government land has been logged. Continued smoke management constraints have limited the number of available burning days needed to accomplish all the required fuels treatments.

Hand and machine piling of slash, and burning in the winter months are much more common in the LAU now. Because of the high cost of timber, utilization of more wood fiber has left many units in the condition where burning is considered unnecessary. However on the steeper slopes in the area alternate treatments like machine piling and chipping are not possible due machinery limitations.

The use of prescribed fire in the late successional reserve forests, especially broadcast burning for reforestation, is expected to decline over the next several decades as wood utilization and environmental restrictions increase. However, there will be a continued need for burning and other alternate fuels management treatments in those commercial forests (matrix) lands where activity fuels are created.

Because the LAU is located in a moist coastal province where fire return intervals can average 150 years, burning for hazard reduction is not considered necessary. According to J. D. Walstad (et al 1990), "It is unlikely that 80 years of fire exclusion has produced unnatural fuel accumulation in westside forests where the fire regimes are characterized by fire return intervals of 200 years ...". The Record of Decision (ROD) for the SEIS indicates the same, stating "...that manipulation of natural stands to reduce fire hazard is generally not necessary due to lower fire occurrence". The ROD does indicate that fuels management treatments would be desirable in plantations.

The use of fuel treatments in the management of the LAU will continue to be important to meet local management goals. For instance the use of fire and fuels management within matrix lands can reduce the risk of wildfire and other large scale disturbances that would jeopardize late-successional reserves. However, the use of broadcast burning for site preparation will be used less often due to smoke management and environmental constraints. The use of alternate fuel treatments mentioned before will gain importance and be used more often.

Alternate fuels treatments such as whole tree yarding, increased utilization of wood fiber, and mechanical treatment like piling, chipping and crushing will gain importance and in the future used more often.

II G.4 SMOKE MANAGEMENT

SMOKE EMISSIONS PRODUCED DURING PRESCRIBED BURNING ARE REGULATED BY THE FEDERAL CLEAN AIR ACT AND LOCALLY BY THE STATE OF OREGON SMOKE MANAGEMENT PLAN. ANY BURNING CONDUCTED IN THE PLANNING UNIT WILL BE IN ACCORDANCE WITH AND APPROVED BY THE LOCAL FOREST PROTECTIVE ASSOCIATIONS. ALL PRESCRIBED BURNING OPERATIONS ARE CONDUCTED WHEN WEATHER CONDITIONS ARE BEST FOR DISPERSING SMOKE EMISSIONS. NORMALLY, UNSTABLE ATMOSPHERIC CONDITIONS COMBINED WITH THE PROPER TRANSPORT WIND AND MIXING HEIGHT WILL DISSIPATE THE SMOKE EFFECTIVELY. THIS PROCESS MITIGATES MOST AIR QUALITY IMPACTS ASSOCIATED WITH BURNING.

DURING PRESCRIBED BURNING, EFFORTS ARE MADE TO DIRECT SMOKE AND PARTICULATE MATTER AWAY FROM DESIGNATED AREAS (POPULATION CENTERS), *LIKE THE CITY OF COTTAGE GROVE 22 MILES TO THE NORTHEAST (NE). THE* EUGENE NON-ATTAINMENT AREA 30 MILES N-NE AND FEDERAL CLASS 1 AREAS LIKE DIAMOND PEAK WILDERNESS 65 MILES EAST. THE STATE MONITORS THESE "INTRUSIONS" AND DETERMINES IF THESE ACTIONS VIOLATE THE AIR QUALITY STANDARDS.

AS WE SHIFT FROM BROADCAST TO UNDERBURNING THE AMOUNT OF EMISSIONS MAY INCREASE FOR A NUMBER OF REASONS. FIRST, IT MAY BE DIFFICULT TO VENT THE SMOKE INTO THE ATMOSPHERE BECAUSE A COLUMN IS NOT PRODUCED AT LOWER BURNING INTENSITIES. SECOND, THE LIKELIHOOD OF RE-BURNING *AND /OR ESCAPE FIRE WILL BE MUCH HIGHER, LEADING TO POTENTIAL* INCREASE IN SMOKE EMISSIONS.

HARVEST OF TIMBER IN THE LAU IS EXPECTED TO INCREASE ON PRIVATE LANDS AS GOVERNMENT TIMBER BECOME LESS AVAILABLE. WITH THIS INCREASE IN LOGGING ON PRIVATE WILL COME MORE PRESCRIBED BURNING AND SMOKE EMISSIONS. ANY INCREASE OF SMOKE PARTICULATE PRODUCED ON NON-PUBLIC LANDS WILL BE OFF SET BY LESS BURNING CONDUCTED BY THE BLM.

THERE ARE A NUMBER OF STEPS WE CAN TAKE TO FURTHER REDUCE SMOKE EMISSIONS. FIRST WE WILL BE BURNING FEWER ACRES IN THE PLANNING UNIT. ALSO WE CAN REDUCE PREBURN FUEL LOADING WITH INCREASED UTILIZATION STANDARDS, WHOLE-TREE YARDING AND FIREWOOD SALES. WE CAN ALSO DO MORE PILE BURNING AND USE HIGHER INTENSITY IGNITION PATTERNS WHEN FUEL MOISTURE IS ON THE HIGH END FOR COMBUSTION.

LIST [illegible]

PAST MGT. AND TIMBER TYPE.

AGE 1 12:04:21 29 JUL 1994 P

ITE...	TWP-RGE-SEC-UNIT	...UNIT ..ACRES	LUA.1K....	TEN.YEAR.. AGE.CLASS	....COVER..CONDITION	EX.STAND.COND..	.ENTIRE.STAND.DESCRIPTION
31190	22S-07W-05-010	23	CON_KWS.N	5	PLANTED	PCT'D/WELL SPCE	PL D1992
31194	22S-07W-05-050	10	CON_KWS.N	5	PLANTED	PCT'D/WELL SPCE	PL D1992
31195	22S-07W-05-060	26	CON_KWS.N	5	PLANTED	PCT'D/WELL SPCE	PL D1992
33566	22S-07W-05-140	22	CON_KWS.N	5	PLANTED	PCT'D/WELL SPCE	PL D11993
		81		***			
32273	22S-07W-05-070	43	CON_KWS.N	10	PLANTED	PCT'D/WELL SPCE	PL D1-=1979
		43		***			
31196	22S-07W-05-080	44	CON_KWS.N	20	PLANTED	NEEDS PCT	PL D1D2-=1976
31197	22S-07W-05-090	53	CON_KWS.N	20	PLANTED	NEEDS PCT	PL D2-=1968
31198	22S-07W-05-100	34	CON_KWS.N	20	PLANTED	NEEDS PCT	PL D2D1-=1976
31199	22S-07W-05-110	57	CON_KWS.N	20	PLANTED	NEEDS PCT	PL D2-=1971
		188		***			
31200	22S-07W-05-120	8	CON_KWS.N	30	SEEDED	NEEDS PCT	S D2-=1966
		8		***			
33564	22S-07W-05-777	3	CON_KWS.N	130		NO TREATMENT	D4-1860//D2=1950
		3		***			
		323 ***					
33565	22S-07W-05-130	35	CON_KWS.Y	5	PLANTED	REG.W.GENETIC	PL D11993
		35		***			
31191	22S-07W-05-020	98	CON_KWS.Y	50	NO PAST STAND MGMT.	NO TREATMENT	ZZ D3D2-=1940
		98		***			
31193	22S-07W-05-040	72	CON_KWS.Y	120	NO PAST STAND MGMT.	NO TREATMENT	ZZ D4=1870//D2-1950
		72		***			
31192	22S-07W-05-030	104	CON_KWS.Y	130	NO PAST STAND MGMT.	NO TREATMENT	ZZ D4-1860//D2=1950
		104		***			
		309 ***					
30664	21S-06W-33-020	28	GFMA_KWS.N	5	PLANTED	ABOVE MIN. STK.	PL D1990
30666	21S-06W-33-040	30	GFMA_KWS.N	5	PLANTED	PCT'D/WELL SPCE	PL D11993
30921	21S-07W-23-030	56	GFMA_KWS.N	5	PLANTED	PCT'D/WELL SPCE	PL D1=1989
30936	21S-07W-23-180	21	GFMA_KWS.N	5	PLANTED	PCT'D/WELL SPCE	PL D1991
31182	22S-07W-03-010	28	GFMA_KWS.N	5	PLANTED	REG.W.GENETIC	PL D1991
31183	22S-07W-03-020	28	GFMA_KWS.N	5	PLANTED	REG.W.GENETIC	PL D1991

ITE...	TWP-RGE-SEC-UNIT	...UNIT ..ACRES	LUA.1K....	TEN.YEAR.. AGE.CLASS	....COVER..CONDITION	EX.STAND.COND..	.ENTIRE.STAND.DESCRIPTION
31184	22S-07W-03-030	32	GFMA_KWS.N	5	PLANTED	REG.W.GENETIC	PL D1991
32129	21S-06W-29-140	19	GFMA_KWS.N	5	PLANTED	PCT'D/WELL SPCE	PL D1-=1990
32274	22S-07W-09-010	12	GFMA_KWS.N	5	PLANTED	PCT'D/WELL SPCE	PL D1990
32275	22S-07W-09-050	25	GFMA_KWS.N	5	PLANTED	PCT'D/WELL SPCE	PL D1991
32277	22S-07W-09-120	25	GFMA_KWS.N	5	PLANTED	PCT'D/WELL SPCE	PL D1991
32278	22S-07W-09-130	15	GFMA_KWS.N	5	PLANTED	PCT'D/WELL SPCE	PL D1991
32279	22S-07W-09-140	43	GFMA_KWS.N	5	PLANTED	PCT'D/WELL SPCE	PL D11993
33082	21S-06W-33-210	23	GFMA_KWS.N	5	PLANTED	PCT'D/WELL SPCE	PL D1991
33391	21S-07W-13-130	36	GFMA_KWS.N	5	PLANTED	PCT'D/WELL SPCE	PL D1-=1988
33425	21S-07W-15-240	35	GFMA_KWS.N	5	PLANTED	PCT'D/WELL SPCE	PL D1-=1989
33500	21S-07W-13-140	53	GFMA_KWS.N	5	PLANTED	PCT'D/WELL SPCE	PL D1990
33563	22S-07W-09-150	11	GFMA_KWS.N	5	PLANTED	PCT'D/WELL SPCE	PL D1992
		520		***			
30920	21S-07W-23-020	34	GFMA_KWS.N	10	PLANTED	PCT'D/WELL SPCE	PL D1-=1977
30924	21S-07W-23-060	10	GFMA_KWS.N	10	PLANTED	PCT'D/WELL SPCE	PL D1-=1977
30925	21S-07W-23-070	34	GFMA_KWS.N	10	PLANTED	PCT'D/WELL SPCE	PL D1-=1977
30927	21S-07W-23-090	18	GFMA_KWS.N	10	PLANTED	NEEDS PCT	PL D1-=1977
30932	21S-07W-23-140	22	GFMA_KWS.N	10	PLANTED	NEEDS PCT	PL D1-=1977
30937	21S-07W-23-200	17	GFMA_KWS.N	10	PLANTED	NEEDS PCT	PL D1-=1978
32127	21S-06W-29-060	76	GFMA_KWS.N	10	PLANTED	PCT'D/WELL SPCE	PL D1-=1977
32167	21S-07W-13-050	1	GFMA_KWS.N	10	PLANTED	PCT'D/WELL SPCE	PL D1-=1985
32168	21S-07W-13-090	42	GFMA_KWS.N	10	PLANTED	PCT'D/WELL SPCE	PL D1-=1979
32276	22S-07W-09-100	27	GFMA_KWS.N	10	PLANTED	PCT'D/WELL SPCE	PL D1-=1982
33158	21S-07W-13-110	42	GFMA_KWS.N	10	PLANTED	PCT'D & FERT	PL D1-=1981
33364	21S-06W-29-121	11	GFMA_KWS.N	10	PLANTED	NEEDS PCT	PL D1-=1980
		334		***			
30642	21S-06W-29-010	033	GFMA_KWS.N	20	PLANTED	NEEDS PCT	PL D1-=1972
30647	21S-06W-29-040	27	GFMA_KWS.N	20	PLANTED	PCT'D/WELL SPCE	PL D1-=1974
30649	21S-06W-29-070	48	GFMA_KWS.N	20	RESIDUAL STAND	NEEDS PCT	R D2D1=1966
30922	21S-07W-23-040	45	GFMA_KWS.N	20	SEEDED	PCT'D/WELL SPCE	S D1-=1968
30923	21S-07W-23-050	37	GFMA_KWS.N	20	PLANTED	NEEDS PCT	PL D1-=1971
30930	21S-07W-23-120	9	GFMA_KWS.N	20	PLANTED	PCT'D/WELL SPCE	PL D1-=1967
30935	21S-07W-23-170	21	GFMA_KWS.N	20	SEEDED	PCT'D/WELL SPCE	S D1-=1968
30944	21S-07W-27-010	26	GFMA_KWS.N	20	PLANTED	NEEDS PCT	PL D1-=1974
30952	21S-07W-27-100	13	GFMA_KWS.N	20	PLANTED	PCT'D/WELL SPCE	PL D1-=1974
31202	22S-07W-09-020	25	GFMA_KWS.N	20	PLANTED	PCT'D/WELL SPCE	PL D1=1972
32128	21S-06W-29-120	17	GFMA_KWS.N	20	PLANTED	PCT'D/WELL SPCE	PL D1-=1976
32272	22S-07W-03-040	76	GFMA_KWS.N	20	PLANTED	NEEDS PCT	PL D1-=1972
33172	21S-07W-23-210	37	GFMA_KWS.N	20	PLANTED	NEEDS PCT	PL D1-=1974
		414		***			
30643	21S-06W-29-020	97	GFMA_KWS.N	30	SEEDED	PCT'D/WELL SPCE	S D2-=1960
30644	21S-06W-29-021	45	GFMA_KWS.N	30	PLANTED	NEEDS PCT	PL D1=1966
30645	21S-06W-29-030	38	GFMA_KWS.N	30	SEEDED	NEEDS PCT	S D1-=1966
30646	21S-06W-29-031	10	GFMA_KWS.N	30	SEEDED	NEEDS PCT	S D1-=1966
30650	21S-06W-29-080	28	GFMA_KWS.N	30	SEEDED	NEEDS PCT	S D1-=1966
30858	21S-07W-13-070	33	GFMA_KWS.N	30	PLANTED	NEEDS PCT	PL D1-=1966
30859	21S-07W-13-080	19	GFMA_KWS.N	30	SEEDED	NEEDS PCT	S D2-=1963
30926	21S-07W-23-080	40	GFMA_KWS.N	30	PLANTED	PCT'D/WELL SPCE	PL D2-=1964

ITE...	TWP-RGE-SEC-UNIT	...UNIT ..ACRES	LUA.1K....	TEN.YEAR.. AGE.CLASS	....COVER..CONDITION	EX.STAND.COND..	.ENTIRE.STAND.DESCRIPTION
30928	21S-07W-23-100	53	GFMA_KWS.N	30	SEEDED	PCT'D/WELL SPCE	S D2-=1962
30945	21S-07W-27-020	13	GFMA_KWS.N	30	PLANTED	PCT'D/WELL SPCE	PL D2-=1964
30949	21S-07W-27-070	129	GFMA_KWS.N	30	PLANTED	PCT'D/WELL SPCE	PL D2-=1963
30953	21S-07W-27-120	40	GFMA_KWS.N	30	PLANTED	ABOVE MIN. STK.	PL D2=1963
31203	22S-07W-09-030	60	GFMA_KWS.N	30	PLANTED	NEEDS PCT	PL D1-=1966
31208	22S-07W-09-090	20	GFMA_KWS.N	30	SEEDED	PCT'D/WELL SPCE	S D1-=1966
31209	22S-07W-09-110	57	GFMA_KWS.N	30	SEEDED	PCT'D/WELL SPCE	S D1-=1966
33183	21S-07W-27-050	10	GFMA_KWS.N	30	PLANTED	PCT'D/WELL SPCE	PL D2-=1964
		692		***			
31207	22S-07W-09-080	20	GFMA_KWS.N	40	NO PAST STAND MGMT.	NO TREATMENT	ZZ D2WF-=1950
31246	22S-07W-17-010	6	GFMA_KWS.N	40	NO PAST STAND MGMT.	NO TREATMENT	ZZ D2-=1950
33083	21S-06W-33-220	3	GFMA_KWS.N	40	NO PAST STAND MGMT.	NO TREATMENT	ZZ D4-1920//D2-=1950
		29		***			
30950	21S-07W-27-080	10	GFMA_KWS.N	50	NO PAST STAND MGMT.	NO TREATMENT	ZZ D4-1870//H3DF=1940
30951	21S-07W-27-090	11	GFMA_KWS.N	50	NO PAST STAND MGMT.	NO TREATMENT	ZZ D3H=1940
30954	21S-07W-27-130	51	GFMA_KWS.N	50	RESIDUAL STAND	NO TREATMENT	R D3H=1940
31185	22S-07W-03-050	52	GFMA_KWS.N	50	NO PAST STAND MGMT.	NO TREATMENT	ZZ D3D2-=1940
31186	22S-07W-03-060	11	GFMA_KWS.N	50	NO PAST STAND MGMT.	NO TREATMENT	ZZ D2RA2-=1940
33184	21S-07W-27-060	24	GFMA_KWS.N	50	NATURALLY STOCKED	CT'D AT AGE 40	N D3-=1940
		159		***			
33077	21S-06W-33-011	4	GFMA_KWS.N	70	NO PAST STAND MGMT.	NO TREATMENT	ZZ D3-=1920
		4		***			
30933	21S-07W-23-150	60	GFMA_KWS.N	80	NO PAST STAND MGMT.	NO TREATMENT	ZZ D4-1780//D2-=1910
		60		***			
30651	21S-06W-29-090	10	GFMA_KWS.N	120	NO PAST STAND MGMT.	NO TREATMENT	ZZ D4-1870//D3WF-1900
31187	22S-07W-03-070	260	GFMA_KWS.N	120	NO PAST STAND MGMT.	NO TREATMENT	ZZ D4D3=1870
31205	22S-07W-09-060	254	GFMA_KWS.N	120	NO PAST STAND MGMT.	NO TREATMENT	ZZ D4=1870
31206	22S-07W-09-070	16	GFMA_KWS.N	120	NO PAST STAND MGMT.	NO TREATMENT	ZZ D4-1870//D2=1950
33185	21S-07W-27-110	83	GFMA_KWS.N	120	NO PAST STAND MGMT.	NO TREATMENT	ZZ D4=1870
33465	22S-07W-03-777	4	GFMA_KWS.N	120	NO PAST STAND MGMT.	NO TREATMENT	ZZ D4D3=1870
		627		***			
30648	21S-06W-29-050	69	GFMA_KWS.N	130	NO PAST STAND MGMT.	NO TREATMENT	ZZ D4-=1860
30652	21S-06W-29-100	17	GFMA_KWS.N	130	RESIDUAL STAND	NO TREATMENT	R D4-1860
30653	21S-06W-29-110	30	GFMA_KWS.N	130	NO PAST STAND MGMT.	NO TREATMENT	ZZ D4=1860
30654	21S-06W-29-130	42	GFMA_KWS.N	130	NO PAST STAND MGMT.	NO TREATMENT	ZZ D4=1860
31204	22S-07W-09-040	6	GFMA_KWS.N	130	NO PAST STAND MGMT.	NO TREATMENT	ZZ D4-1860//D3=1900
		164		***			
31247	22S-07W-17-020	73	GFMA_KWS.N	170	NO PAST STAND MGMT.	NO TREATMENT	ZZ D4=1817
		73		***			

SITE...	TWP-RGE-SEC-UNIT	...UNIT ..ACRES	LUA.1K....	TEN.YEAR.. AGE.CLASS	....COVER..CONDITION	EX.STAND.COND..	.ENTIRE.STAND.DESCRIPTION
30919	21S-07W-23-010	107	GFMA_KWS.N	210	NO PAST STAND MGMT.	NO TREATMENT	ZZ D4=1780//D3-1880
		107		***			
		3183	***				
33501	21S-07W-13-060	63	GFMA_KWS.Y	5	PLANTED	PCT'D/WELL SPCE	PL D1991
		63		***			
32169	21S-07W-13-100	22	GFMA_KWS.Y	10	PLANTED	PCT'D & FERT	PL D1-=1981
33159	21S-07W-13-120	36	GFMA_KWS.Y	10	PLANTED	PCT'D & FERT	PL D1-=1981
		58		***			
30854	21S-07W-13-010	94	GFMA_KWS.Y	20	PLANTED	PCT'D & FERT	PL D1-=1975
		94		***			
30874	21S-07W-15-120	23	GFMA_KWS.Y	30	SEEDED	PCT'D/WELL SPCE	S D2-=1962
		23		***			
30877	21S-07W-15-140	102	GFMA_KWS.Y	140	NO PAST STAND MGMT.	NO TREATMENT	ZZ D4=1850
		102		***			
30856	21S-07W-13-030	134	GFMA_KWS.Y	170	NO PAST STAND MGMT.	NO TREATMENT	ZZ D4=1820//D3-1880
		134		***			
		474	***				
30600	21S-06W-17-010	40	LSR_KWS.N	5	PLANTED	PCT'D/WELL SPCE	PL D1-=1989
32113	21S-06W-16-090	31	LSR_KWS.N	5	PLANTED	PCT'D/WELL SPCE	PL D1=1989
32114	21S-06W-17-011	4	LSR_KWS.N	5	PLANTED	PCT'D/WELL SPCE	PL D1-=1987
32121	21S-06W-21-090	10	LSR_KWS.N	5	PLANTED	PCT'D/WELL SPCE	PL D1-=1989
33136	21S-06W-19-070	17	LSR_KWS.N	5	PLANTED	PCT'D/WELL SPCE	PL D1-=1987
33601	21S-06W-19-080	39	LSR_KWS.N	5	PLANTED	PCT'D/WELL SPCE	PL 1994
33602	21S-06W-19-090	78	LSR_KWS.N	5	PLANTED	PCT'D/WELL SPCE	PL 1994
		219		***			
32116	21S-06W-18-040	33	LSR_KWS.N	10	PLANTED	PCT'D/WELL SPCE	PL D1-=1985
32117	21S-06W-19-040	3	LSR_KWS.N	10	PLANTED	PCT'D/WELL SPCE	PL D1-=1985
32118	21S-06W-19-050	41	LSR_KWS.N	10	PLANTED	PCT'D/WELL SPCE	PL D1-=1985
32119	21S-06W-19-060	44	LSR_KWS.N	10	PLANTED	PCT'D/WELL SPCE	PL D1-=1986
32120	21S-06W-20-011	15	LSR_KWS.N	10	PLANTED	PCT'D/WELL SPCE	PL D1-=1986
		136		***			

SITE...	TWP-RGE-SEC-UNIT	...UNIT ..ACRES	LUA.1K....	TEN.YEAR.. AGE.CLASS	....COVER..CONDITION	EX.STAND.COND..	.ENTIRE.STAND.DESCRIPTION
30602	21S-06W-17-030	35	LSR_KWS.N	30	PLANTED	PCT'D/WELL SPCE	PL D2-=1960
30607	21S-06W-19-030	6	LSR_KWS.N	30	PLANTED	NEEDS PCT	PL D1-=1966
30613	21S-06W-21-050	39	LSR_KWS.N	30	PLANTED	PCT'D/WELL SPCE	PL D2D1-=1960
		80		***			
33154	21S-06W-20-020	8	LSR_KWS.N	50	NO PAST STAND MGMT.	NO TREATMENT	ZZ D3-=1940
		8		***			
30606	21S-06W-19-020	12	LSR_KWS.N	60	NO PAST STAND MGMT.	NO TREATMENT	ZZ D3-=1923
30612	21S-06W-21-040	10	LSR_KWS.N	60	NO PAST STAND MGMT.	NO TREATMENT	ZZ D3-=1930
		22		***			
30610	21S-06W-21-020	25	LSR_KWS.N	70	NO PAST STAND MGMT.	NO TREATMENT	ZZ D3-=1920
30616	21S-06W-21-100	54	LSR_KWS.N	70	NO PAST STAND MGMT.	NO TREATMENT	ZZ D3D2-=1920
		79		***			
30022	21S-06W-18-030	85	LSR_KWS.N	100	NO PAST STAND MGMT.	NO TREATMENT	ZZ D4-1860//D3=1890
		85		***			
30601	21S-06W-17-020	554	LSR_KWS.N	120	NO PAST STAND MGMT.	NO TREATMENT	ZZ D4D3-=1870
		554		***			
30605	21S-06W-19-010	349	LSR_KWS.N	130	NO PAST STAND MGMT.	NO TREATMENT	ZZ D4-=1860
33603	21S-06W-19-777	2	LSR_KWS.N	130		NO TREATMENT	D4-=1860
		351		***			
30024	21S-06W-20-010	14	LSR_KWS.N	150	NO PAST STAND MGMT.	NO TREATMENT	ZZ D4=1840//D3-1900
		14		***			
30609	21S-06W-21-010	25	LSR_KWS.N	210	NO PAST STAND MGMT.	NO TREATMENT	ZZ D4D3-=1780
30611	21S-06W-21-030	463	LSR_KWS.N	210	NO PAST STAND MGMT.	NO TREATMENT	ZZ D4-=1780
		488		***			
		2036 ***					
32115	21S-06W-18-011	2	LSR_KWS.Y	10	PLANTED	PCT'D/WELL SPCE	PL D1-=1985
		2		***			
30020	21S-06W-18-010	59	LSR_KWS.Y	100	NO PAST STAND MGMT.	NO TREATMENT	ZZ D3-=1890
		59		***			
30021	21S-06W-18-020	8	LSR_KWS.Y	130	NO PAST STAND MGMT.	NO TREATMENT	ZZ D4=1860//D3-1890

ITE...	TWP-RGE-SEC-UNIT	...UNIT ..ACRES	LUA.1K....	TEN.YEAR.. AGE.CLASS	....COVER..CONDITION	EX.STAND.COND..	.ENTIRE.STAND.DESCRIPTION
30589	21S-06W-15-070	148	LSR_KWS.Y	130	NO PAST STAND MGMT.	NO TREATMENT	ZZ D4=1860//D3-1900
30592	21S-06W-16-010	466	LSR_KWS.Y	130	NO PAST STAND MGMT.	NO TREATMENT	ZZ D4D3-=1860
30618	21S-06W-22-010	116	LSR_KWS.Y	130	NO PAST STAND MGMT.	NO TREATMENT	ZZ D4=1860//D3-1890
		738		***			
		799	***				
33595	21S-06W-27-080	12	MMR_KWS.N	0	RECENT CLEARCUT	SP, NEED REGEN	X 1994
		12		***			
31171	22S-07W-01-010	45	MMR_KWS.N	5	PLANTED	PCT'D/WELL SPCE	PL D1990
31177	22S-07W-01-080	38	MMR_KWS.N	5	PLANTED	PCT'D/WELL SPCE	PL D1991
33071	21S-06W-27-010	9	MMR_KWS.N	5	PLANTED	PCT'D/WELL SPCE	PL 1994
33075	21S-06W-27-090	44	MMR_KWS.N	5	PLANTED	PCT'D/WELL SPCE	PL D1990
33513	21S-06W-31-100	28	MMR_KWS.N	5	PLANTED	PCT'D/WELL SPCE	PL D1990
33514	21S-06W-31-110	30	MMR_KWS.N	5	PLANTED	PCT'D/WELL SPCE	PL D1991
33515	21S-06W-31-120	26	MMR_KWS.N	5	PLANTED	PCT'D/WELL SPCE	PL D1991
33596	21S-06W-27-110	30	MMR_KWS.N	5	PLANTED	PCT'D/WELL SPCE	PL 1994
		250		***			
30942	21S-07W-25-993	19	MMR_KWS.N	10	PLANTED	REG.W.GENETIC	PL D2-=1982
32130	21S-06W-31-070	44	MMR_KWS.N	10	PLANTED	PCT'D/WELL SPCE	PL D1-=1978
32131	21S-06W-31-080	34	MMR_KWS.N	10	PLANTED	PCT'D/WELL SPCE	PL D1-=1978
32132	21S-06W-31-090	36	MMR_KWS.N	10	PLANTED	NEEDS PCT	PL D1-=1979
33115	21S-07W-25-020	46	MMR_KWS.N	10	PLANTED	PCT'D/WELL SPCE	PL D1-=1985
33116	21S-07W-35-140	24	MMR_KWS.N	10	PLANTED	PCT'D/WELL SPCE	PL D1-=1986
33117	21S-07W-35-150	34	MMR_KWS.N	10	PLANTED	PCT'D/WELL SPCE	PL D1-=1986
33118	21S-07W-35-130	26	MMR_KWS.N	10	PLANTED	PCT'D/WELL SPCE	PL D1-=1986
		263		***			
30636	21S-06W-27-020	62	MMR_KWS.N	20	PLANTED	NEEDS PCT	PL D1-=1968
31218	22S-07W-11-080	35	MMR_KWS.N	20	PLANTED	NEEDS PCT	PL D1-=1969
32271	22S-07W-01-050	24	MMR_KWS.N	20	PLANTED	PCT'D/WELL SPCE	PL D1-=1976
33155	21S-06W-31-030	35	MMR_KWS.N	20	PLANTED	PCT'D/WELL SPCE	PL D1-=1975
		156		***			
30941	21S-07W-25-040	43	MMR_KWS.N	30	RESIDUAL STAND	NO TREATMENT	R D4-1857//D2-=1960
30957	21S-07W-35-020	10	MMR_KWS.N	30	PLANTED	NEEDS PCT	PL D1-=1965
30958	21S-07W-35-030	57	MMR_KWS.N	30	PLANTED	NEEDS PCT	PL D2-=1962
30964	21S-07W-35-080	9	MMR_KWS.N	30	PLANTED	NEEDS PCT	PL D2-=1965
30965	21S-07W-35-090	19	MMR_KWS.N	30	PLANTED	NEEDS PCT	PL D1-=1965
31175	22S-07W-01-060	43	MMR_KWS.N	30	PLANTED	PCT'D/WELL SPCE	PL D2-=1960
31219	22S-07W-11-090	23	MMR_KWS.N	30	PLANTED	ABOVE MIN. STK.	PL D2=1965
		204		***			
31174	22S-07W-01-040	25	MMR_KWS.N	40	RESIDUAL STAND	NO TREATMENT	R D4GF4-1780//D3GF3-=1950
31178	22S-07W-01-090	58	MMR_KWS.N	40	NATURALLY STOCKED	PCT'D/WELL SPCE	N GF3D-=1950

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ITE...	TWP-RGE-SEC-UNIT	...UNIT ..ACRES	LUA.1K....	TEN.YEAR.. AGE.CLASS	....COVER..CONDITION	EX.STAND.COND..	.ENTIRE.STAND.DESCRIPTION
31212	22S-07W-11-020	110	MMR_KWS.N	40	NO PAST STAND MGMT.	NO TREATMENT	ZZ D2=1950
31214	22S-07W-11-040	59	MMR_KWS.N	40	NO PAST STAND MGMT.	NO TREATMENT	ZZ D4-1870//D2WF=1950
		252		***			
30657	21S-06W-31-020	37	MMR_KWS.N	50	NO PAST STAND MGMT.	NO TREATMENT	ZZ D4-1860//D2=1940
30659	21S-06W-31-050	12	MMR_KWS.N	50	NATURALLY STOCKED	NO TREATMENT	N D2=1940
30660	21S-06W-31-060	32	MMR_KWS.N	50	NO PAST STAND MGMT.	NO TREATMENT	ZZ D2-=1940
30966	21S-07W-35-100	23	MMR_KWS.N	50	NATURALLY STOCKED	NO TREATMENT	N D3D2-=1930
33119	21S-07W-35-071	23	MMR_KWS.N	50	NO PAST STAND MGMT.	NO TREATMENT	ZZ D2=1940
33120	21S-07W-35-110	11	MMR_KWS.N	50	NATURALLY STOCKED	NO TREATMENT	N D3=1940
		138		***			
30637	21S-06W-27-030	44	MMR_KWS.N	60	NO PAST STAND MGMT.	NO TREATMENT	ZZ D4-1830//D2HD2=1930
30940	21S-07W-25-030	19	MMR_KWS.N	60	NO PAST STAND MGMT.	CT'D AT AGE 60	ZZ D3-=1923
30959	21S-07W-35-040	15	MMR_KWS.N	60	NO PAST STAND MGMT.	NO TREATMENT	ZZ D3=1930
30960	21S-07W-35-050	14	MMR_KWS.N	60	NO PAST STAND MGMT.	NO TREATMENT	ZZ D3-=1930
30962	21S-07W-35-070	37	MMR_KWS.N	60	NO PAST STAND MGMT.	NO TREATMENT	ZZ D3-=1930
33073	21S-06W-27-070	12	MMR_KWS.N	60	NO PAST STAND MGMT.	NO TREATMENT	ZZ D3-=1930
		141		***			
33121	21S-07W-35-120	5	MMR_KWS.N	70	NO PAST STAND MGMT.	CT'D AT AGE 60	ZZ D3-=1920
		5		***			
31179	22S-07W-01-100	22	MMR_KWS.N	80	NO PAST STAND MGMT.	NO TREATMENT	ZZ D4D3GF3-=1910
		22		***			
31236	22S-07W-15-010	55	MMR_KWS.N	100	NO PAST STAND MGMT.	NO TREATMENT	ZZ D4=1890
		55		***			
30956	21S-07W-35-010	250	MMR_KWS.N	110	NO PAST STAND MGMT.	NO TREATMENT	ZZ D4=1880
30961	21S-07W-35-060	56	MMR_KWS.N	110	NO PAST STAND MGMT.	NO TREATMENT	ZZ D4=1880
		306		***			
30658	21S-06W-31-040	23	MMR_KWS.N	120	NO PAST STAND MGMT.	NO TREATMENT	ZZ D4-1870//D3=1930
31211	22S-07W-11-010	8	MMR_KWS.N	120	NO PAST STAND MGMT.	NO TREATMENT	ZZ D4WF-1870//D3WF-1910
		31		***			
30638	21S-06W-27-040	311	MMR_KWS.N	130	NO PAST STAND MGMT.	NO TREATMENT	ZZ D4=1860//D3-1930
30656	21S-06W-31-010	256	MMR_KWS.N	130	NO PAST STAND MGMT.	NO TREATMENT	ZZ D4-=1860
33476	22S-07W-01-777	10	MMR_KWS.N	130	NO PAST STAND MGMT.	NO TREATMENT	ZZ D4=1860
33516	21S-06W-31-777	16	MMR_KWS.N	130	NO PAST STAND MGMT.	NO TREATMENT	ZZ D4-1860
33597	21S-06W-27-777	2	MMR_KWS.N	130		NO TREATMENT	D4=1860//D3-1930
		595		***			
30939	21S-07W-25-010	492	MMR_KWS.N	210	NO PAST STAND MGMT.	NO TREATMENT	ZZ D4-1780//D3=1900

ITE...	TWP-RGE-SEC-UNIT	...UNIT ..ACRES	LUA.1K....	TEN.YEAR.. AGE.CLASS	....COVER..CONDITION	EX.STAND.COND..	.ENTIRE.STAND.DESCRIPTION
31217	22S-07W-11-070	94	MMR_KWS.N	210	NO PAST STAND MGMT.	NO TREATMENT	ZZ D4-1780//D3GF-=1950
		586		***			
31172	22S-07W-01-020	307	MMR_KWS.N	230	NO PAST STAND MGMT.	NO TREATMENT	ZZ D4-=1760
		307		***			
31221	22S-07W-11-110	21	MMR_KWS.N	999	WATER/MARSH	NON-FOREST	NW
31244	22S-07W-15-090	16	MMR_KWS.N	999	WATER/MARSH	NON-FOREST	NW
33604	21S-07W-25-998	3	MMR_KWS.N	999	ROADS/MAINT.FACILITY	NON-FOREST	NH
		40		***			
		3363	***				
30946	21S-07W-27-021	16	RHA_KWS.N	30	PLANTED	PCT'D/WELL SPCE	PL D2-=1964
30947	21S-07W-27-030	37	RHA_KWS.N	30	SEEDED	NEEDS PCT	S D1=1967
		53		***			
30948	21S-07W-27-040	161	RHA_KWS.N	120	NO PAST STAND MGMT.	NO TREATMENT	ZZ D4-1870//D3H-1910
		161		***			
		214	***				
***		10701					

203 Records Processed 2

PAST TREATMENT and TIMBER TYPE.

SITE...	TWP-RGE-SEC-UNIT	...UNIT ..ACRES	LUA.1K....	....COVER..CONDITION	EX.STAND.COND..	.ENTIRE.STAND.DESCRIPTION
33564	22S-07W-05-777	3	CON_KWS.N		NO TREATMENT	D4-1860//D2=1950
		3		***		
31200	22S-07W-05-120	8	CON_KWS.N	SEEDED	NEEDS PCT	S D2-=1966
		8		***		
31190	22S-07W-05-010	23	CON_KWS.N	PLANTED	PCT'D/WELL SPCE	PL D1992
31194	22S-07W-05-050	10	CON_KWS.N	PLANTED	PCT'D/WELL SPCE	PL D1992
31195	22S-07W-05-060	26	CON_KWS.N	PLANTED	PCT'D/WELL SPCE	PL D1992
31196	22S-07W-05-080	44	CON_KWS.N	PLANTED	NEEDS PCT	PL D1D2-=1976
31197	22S-07W-05-090	53	CON_KWS.N	PLANTED	NEEDS PCT	PL D2-=1968
31198	22S-07W-05-100	34	CON_KWS.N	PLANTED	NEEDS PCT	PL D2D1-=1976
31199	22S-07W-05-110	57	CON_KWS.N	PLANTED	NEEDS PCT	PL D2-=1971
32273	22S-07W-05-070	43	CON_KWS.N	PLANTED	PCT'D/WELL SPCE	PL D1-=1979
33566	22S-07W-05-140	22	CON_KWS.N	PLANTED	PCT'D/WELL SPCE	PL D11993
		312		***		
		323 ***				
33565	22S-07W-05-130	35	CON_KWS.Y	PLANTED	REG.W.GENETIC	PL D11993
		35		***		
31191	22S-07W-05-020	98	CON_KWS.Y	NO PAST STAND MGMT.	NO TREATMENT	ZZ D3D2-=1940
31192	22S-07W-05-030	104	CON_KWS.Y	NO PAST STAND MGMT.	NO TREATMENT	ZZ D4-1860//D2=1950
31193	22S-07W-05-040	72	CON_KWS.Y	NO PAST STAND MGMT.	NO TREATMENT	ZZ D4=1870//D2-1950
		274		***		
		309 ***				
30643	21S-06W-29-020	97	GFMA_KWS.N	SEEDED	PCT'D/WELL SPCE	S D2-=1960
30645	21S-06W-29-030	38	GFMA_KWS.N	SEEDED	NEEDS PCT	S D1-=1966
30646	21S-06W-29-031	10	GFMA_KWS.N	SEEDED	NEEDS PCT	S D1-=1966
30650	21S-06W-29-080	28	GFMA_KWS.N	SEEDED	NEEDS PCT	S D1-=1966
30859	21S-07W-13-080	19	GFMA_KWS.N	SEEDED	NEEDS PCT	S D2-=1963
30922	21S-07W-23-040	45	GFMA_KWS.N	SEEDED	PCT'D/WELL SPCE	S D1-=1968
30928	21S-07W-23-100	53	GFMA_KWS.N	SEEDED	PCT'D/WELL SPCE	S D2-=1962
30935	21S-07W-23-170	21	GFMA_KWS.N	SEEDED	PCT'D/WELL SPCE	S D1-=1968
31208	22S-07W-09-090	20	GFMA_KWS.N	SEEDED	PCT'D/WELL SPCE	S D1-=1966
31209	22S-07W-09-110	57	GFMA_KWS.N	SEEDED	PCT'D/WELL SPCE	S D1-=1966
		388		***		
30642	21S-06W-29-010	033	GFMA_KWS.N	PLANTED	NEEDS PCT	PL D1-=1972
30644	21S-06W-29-021	45	GFMA_KWS.N	PLANTED	NEEDS PCT	PL D1=1966
30647	21S-06W-29-040	27	GFMA_KWS.N	PLANTED	PCT'D/WELL SPCE	PL D1-=1974
30664	21S-06W-33-020	28	GFMA_KWS.N	PLANTED	ABOVE MIN. STK.	PL D1990
30666	21S-06W-33-040	30	GFMA_KWS.N	PLANTED	PCT'D/WELL SPCE	PL D11993

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SITE...	TWP-RGE-SEC-UNIT	...UNIT ..ACRES	LUA.1K....	....COVER..	CONDITION EX.STAND.COND..	.ENTIRE.STAND.DESCRIPTION
30858	21S-07W-13-070	33	GFMA_KWS.N	PLANTED	NEEDS PCT	PL D1-=1966
30920	21S-07W-23-020	34	GFMA_KWS.N	PLANTED	PCT'D/WELL SPCE	PL D1-=1977
30921	21S-07W-23-030	56	GFMA_KWS.N	PLANTED	PCT'D/WELL SPCE	PL D1=1989
30923	21S-07W-23-050	37	GFMA_KWS.N	PLANTED	NEEDS PCT	PL D1-=1971
30924	21S-07W-23-060	10	GFMA_KWS.N	PLANTED	PCT'D/WELL SPCE	PL D1-=1977
30925	21S-07W-23-070	34	GFMA_KWS.N	PLANTED	PCT'D/WELL SPCE	PL D1-=1977
30926	21S-07W-23-080	40	GFMA_KWS.N	PLANTED	PCT'D/WELL SPCE	PL D2-=1964
30927	21S-07W-23-090	18	GFMA_KWS.N	PLANTED	NEEDS PCT	PL D1-=1977
30930	21S-07W-23-120	9	GFMA_KWS.N	PLANTED	PCT'D/WELL SPCE	PL D1-=1967
30932	21S-07W-23-140	22	GFMA_KWS.N	PLANTED	NEEDS PCT	PL D1-=1977
30936	21S-07W-23-180	21	GFMA_KWS.N	PLANTED	PCT'D/WELL SPCE	PL D1991
30937	21S-07W-23-200	17	GFMA_KWS.N	PLANTED	NEEDS PCT	PL D1-=1978
30944	21S-07W-27-010	26	GFMA_KWS.N	PLANTED	NEEDS PCT	PL D1-=1974
30945	21S-07W-27-020	13	GFMA_KWS.N	PLANTED	PCT'D/WELL SPCE	PL D2-=1964
30949	21S-07W-27-070	129	GFMA_KWS.N	PLANTED	PCT'D/WELL SPCE	PL D2-=1963
30952	21S-07W-27-100	13	GFMA_KWS.N	PLANTED	PCT'D/WELL SPCE	PL D1-=1974
30953	21S-07W-27-120	40	GFMA_KWS.N	PLANTED	ABOVE MIN. STK.	PL D2=1963
31182	22S-07W-03-010	28	GFMA_KWS.N	PLANTED	REG.W.GENETIC	PL D1991
31183	22S-07W-03-020	28	GFMA_KWS.N	PLANTED	REG.W.GENETIC	PL D1991
31184	22S-07W-03-030	32	GFMA_KWS.N	PLANTED	REG.W.GENETIC	PL D1991
31202	22S-07W-09-020	25	GFMA_KWS.N	PLANTED	PCT'D/WELL SPCE	PL D1=1972
31203	22S-07W-09-030	60	GFMA_KWS.N	PLANTED	NEEDS PCT	PL D1-=1966
32127	21S-06W-29-060	76	GFMA_KWS.N	PLANTED	PCT'D/WELL SPCE	PL D1-=1977
32128	21S-06W-29-120	17	GFMA_KWS.N	PLANTED	PCT'D/WELL SPCE	PL D1-=1976
32129	21S-06W-29-140	19	GFMA_KWS.N	PLANTED	PCT'D/WELL SPCE	PL D1-=1990
32167	21S-07W-13-050	1	GFMA_KWS.N	PLANTED	PCT'D/WELL SPCE	PL D1-=1985
32168	21S-07W-13-090	42	GFMA_KWS.N	PLANTED	PCT'D/WELL SPCE	PL D1-=1979
32272	22S-07W-03-040	76	GFMA_KWS.N	PLANTED	NEEDS PCT	PL D1-=1972
32274	22S-07W-09-010	12	GFMA_KWS.N	PLANTED	PCT'D/WELL SPCE	PL D1990
32275	22S-07W-09-050	25	GFMA_KWS.N	PLANTED	PCT'D/WELL SPCE	PL D1991
32276	22S-07W-09-100	27	GFMA_KWS.N	PLANTED	PCT'D/WELL SPCE	PL D1-=1982
32277	22S-07W-09-120	25	GFMA_KWS.N	PLANTED	PCT'D/WELL SPCE	PL D1991
32278	22S-07W-09-130	15	GFMA_KWS.N	PLANTED	PCT'D/WELL SPCE	PL D1991
32279	22S-07W-09-140	43	GFMA_KWS.N	PLANTED	PCT'D/WELL SPCE	PL D11993
33082	21S-06W-33-210	23	GFMA_KWS.N	PLANTED	PCT'D/WELL SPCE	PL D1991
33158	21S-07W-13-110	42	GFMA_KWS.N	PLANTED	PCT'D & FERT	PL D1-=1981
33172	21S-07W-23-210	37	GFMA_KWS.N	PLANTED	NEEDS PCT	PL D1-=1974
33183	21S-07W-27-050	10	GFMA_KWS.N	PLANTED	PCT'D/WELL SPCE	PL D2-=1964
33364	21S-06W-29-121	11	GFMA_KWS.N	PLANTED	NEEDS PCT	PL D1-=1980
33391	21S-07W-13-130	36	GFMA_KWS.N	PLANTED	PCT'D/WELL SPCE	PL D1-=1988
33425	21S-07W-15-240	35	GFMA_KWS.N	PLANTED	PCT'D/WELL SPCE	PL D1-=1989
33500	21S-07W-13-140	53	GFMA_KWS.N	PLANTED	PCT'D/WELL SPCE	PL D1990
33563	22S-07W-09-150	11	GFMA_KWS.N	PLANTED	PCT'D/WELL SPCE	PL D1992
		1524		***		
30649	21S-06W-29-070	48	GFMA_KWS.N	RESIDUAL STAND	NEEDS PCT	R D2D1=1966
30652	21S-06W-29-100	17	GFMA_KWS.N	RESIDUAL STAND	NO TREATMENT	R D4-1860
30954	21S-07W-27-130	51	GFMA_KWS.N	RESIDUAL STAND	NO TREATMENT	R D3H=1940
		116		***		
33184	21S-07W-27-060	24	GFMA_KWS.N	NATURALLY STOCKED	CT'D AT AGE 40	N D3-=1940

SITE...	TWP-RGE-SEC-UNIT	...UNIT ..ACRES	LUA.1K....	....COVER..CONDITION	EX.STAND.COND..	.ENTIRE.STAND.DESCRIPTION
		24		***		
30648	21S-06W-29-050	69	GFMA_KWS.N	NO PAST STAND MGMT.	NO TREATMENT	ZZ D4-=1860
30651	21S-06W-29-090	10	GFMA_KWS.N	NO PAST STAND MGMT.	NO TREATMENT	ZZ D4-1870//D3WF-1900
30653	21S-06W-29-110	30	GFMA_KWS.N	NO PAST STAND MGMT.	NO TREATMENT	ZZ D4=1860
30654	21S-06W-29-130	42	GFMA_KWS.N	NO PAST STAND MGMT.	NO TREATMENT	ZZ D4=1860
30919	21S-07W-23-010	107	GFMA_KWS.N	NO PAST STAND MGMT.	NO TREATMENT	ZZ D4=1780//D3-1880
30933	21S-07W-23-150	60	GFMA_KWS.N	NO PAST STAND MGMT.	NO TREATMENT	ZZ D4-1780//D2-=1910
30950	21S-07W-27-080	10	GFMA_KWS.N	NO PAST STAND MGMT.	NO TREATMENT	ZZ D4-1870//H3DF=1940
30951	21S-07W-27-090	11	GFMA_KWS.N	NO PAST STAND MGMT.	NO TREATMENT	ZZ D3H=1940
31185	22S-07W-03-050	52	GFMA_KWS.N	NO PAST STAND MGMT.	NO TREATMENT	ZZ D3D2-=1940
31186	22S-07W-03-060	11	GFMA_KWS.N	NO PAST STAND MGMT.	NO TREATMENT	ZZ D2RA2-=1940
31187	22S-07W-03-070	260	GFMA_KWS.N	NO PAST STAND MGMT.	NO TREATMENT	ZZ D4D3=1870
31204	22S-07W-09-040	6	GFMA_KWS.N	NO PAST STAND MGMT.	NO TREATMENT	ZZ D4-1860//D3=1900
31205	22S-07W-09-060	254	GFMA_KWS.N	NO PAST STAND MGMT.	NO TREATMENT	ZZ D4=1870
31206	22S-07W-09-070	16	GFMA_KWS.N	NO PAST STAND MGMT.	NO TREATMENT	ZZ D4-1870//D2=1950
31207	22S-07W-09-080	20	GFMA_KWS.N	NO PAST STAND MGMT.	NO TREATMENT	ZZ D2WF-=1950
31246	22S-07W-17-010	6	GFMA_KWS.N	NO PAST STAND MGMT.	NO TREATMENT	ZZ D2-=1950
31247	22S-07W-17-020	73	GFMA_KWS.N	NO PAST STAND MGMT.	NO TREATMENT	ZZ D4=1817
33077	21S-06W-33-011	4	GFMA_KWS.N	NO PAST STAND MGMT.	NO TREATMENT	ZZ D3-=1920
33083	21S-06W-33-220	3	GFMA_KWS.N	NO PAST STAND MGMT.	NO TREATMENT	ZZ D4-1920//D2-=1950
33185	21S-07W-27-110	83	GFMA_KWS.N	NO PAST STAND MGMT.	NO TREATMENT	ZZ D4=1870
33465	22S-07W-03-777	4	GFMA_KWS.N	NO PAST STAND MGMT.	NO TREATMENT	ZZ D4D3=1870
		1131		***		
		3183 ***				
30874	21S-07W-15-120	23	GFMA_KWS.Y	SEEDED	PCT'D/WELL SPCE	S D2-=1962
		23		***		
30854	21S-07W-13-010	94	GFMA_KWS.Y	PLANTED	PCT'D & FERT	PL D1-=1975
32169	21S-07W-13-100	22	GFMA_KWS.Y	PLANTED	PCT'D & FERT	PL D1-=1981
33159	21S-07W-13-120	36	GFMA_KWS.Y	PLANTED	PCT'D & FERT	PL D1-=1981
33501	21S-07W-13-060	63	GFMA_KWS.Y	PLANTED	PCT'D/WELL SPCE	PL D1991
		215		***		
30856	21S-07W-13-030	134	GFMA_KWS.Y	NO PAST STAND MGMT.	NO TREATMENT	ZZ D4=1820//D3-1880
30877	21S-07W-15-140	102	GFMA_KWS.Y	NO PAST STAND MGMT.	NO TREATMENT	ZZ D4=1850
		236		***		
		474 ***				
33603	21S-06W-19-777	2	LSR_KWS.N		NO TREATMENT	D4-=1860
		2		***		
30600	21S-06W-17-010	40	LSR_KWS.N	PLANTED	PCT'D/WELL SPCE	PL D1-=1989
30602	21S-06W-17-030	35	LSR_KWS.N	PLANTED	PCT'D/WELL SPCE	PL D2-=1960

SITE...	TWP-RGE-SEC-UNIT	...UNIT ..ACRES	LUA.1K....	....COVER..	CONDITION	EX.STAND.COND..	.ENTIRE.STAND.DESCRIPTION
30607	21S-06W-19-030	6	LSR_KWS.N		PLANTED	NEEDS PCT	PL D1-=1966
30613	21S-06W-21-050	39	LSR_KWS.N		PLANTED	PCT'D/WELL SPCE	PL D2D1-=1960
32113	21S-06W-16-090	31	LSR_KWS.N		PLANTED	PCT'D/WELL SPCE	PL D1=1989
32114	21S-06W-17-011	4	LSR_KWS.N		PLANTED	PCT'D/WELL SPCE	PL D1-=1987
32116	21S-06W-18-040	33	LSR_KWS.N		PLANTED	PCT'D/WELL SPCE	PL D1-=1985
32117	21S-06W-19-040	3	LSR_KWS.N		PLANTED	PCT'D/WELL SPCE	PL D1-=1985
32118	21S-06W-19-050	41	LSR_KWS.N		PLANTED	PCT'D/WELL SPCE	PL D1-=1985
32119	21S-06W-19-060	44	LSR_KWS.N		PLANTED	PCT'D/WELL SPCE	PL D1-=1986
32120	21S-06W-20-011	15	LSR_KWS.N		PLANTED	PCT'D/WELL SPCE	PL D1-=1986
32121	21S-06W-21-090	10	LSR_KWS.N		PLANTED	PCT'D/WELL SPCE	PL D1-=1989
33136	21S-06W-19-070	17	LSR_KWS.N		PLANTED	PCT'D/WELL SPCE	PL D1-=1987
33601	21S-06W-19-080	39	LSR_KWS.N		PLANTED	PCT'D/WELL SPCE	PL 1994
33602	21S-06W-19-090	78	LSR_KWS.N		PLANTED	PCT'D/WELL SPCE	PL 1994
		435			***		
30022	21S-06W-18-030	85	LSR_KWS.N	NO PAST STAND MGMT.		NO TREATMENT	ZZ D4-1860//D3=1890
30024	21S-06W-20-010	14	LSR_KWS.N	NO PAST STAND MGMT.		NO TREATMENT	ZZ D4=1840//D3-1900
30601	21S-06W-17-020	554	LSR_KWS.N	NO PAST STAND MGMT.		NO TREATMENT	ZZ D4D3-=1870
30605	21S-06W-19-010	349	LSR_KWS.N	NO PAST STAND MGMT.		NO TREATMENT	ZZ D4-=1860
30606	21S-06W-19-020	12	LSR_KWS.N	NO PAST STAND MGMT.		NO TREATMENT	ZZ D3-=1923
30609	21S-06W-21-010	25	LSR_KWS.N	NO PAST STAND MGMT.		NO TREATMENT	ZZ D4D3-=1780
30610	21S-06W-21-020	25	LSR_KWS.N	NO PAST STAND MGMT.		NO TREATMENT	ZZ D3-=1920
30611	21S-06W-21-030	463	LSR_KWS.N	NO PAST STAND MGMT.		NO TREATMENT	ZZ D4-=1780
30612	21S-06W-21-040	10	LSR_KWS.N	NO PAST STAND MGMT.		NO TREATMENT	ZZ D3-=1930
30616	21S-06W-21-100	54	LSR_KWS.N	NO PAST STAND MGMT.		NO TREATMENT	ZZ D3D2-=1920
33154	21S-06W-20-020	8	LSR_KWS.N	NO PAST STAND MGMT.		NO TREATMENT	ZZ D3-=1940
		1599			***		
		2036 ***					
32115	21S-06W-18-011	2	LSR_KWS.Y		PLANTED	PCT'D/WELL SPCE	PL D1-=1985
		2			***		
30020	21S-06W-18-010	59	LSR_KWS.Y	NO PAST STAND MGMT.		NO TREATMENT	ZZ D3-=1890
30021	21S-06W-18-020	8	LSR_KWS.Y	NO PAST STAND MGMT.		NO TREATMENT	ZZ D4=1860//D3-1890
30589	21S-06W-15-070	148	LSR_KWS.Y	NO PAST STAND MGMT.		NO TREATMENT	ZZ D4=1860//D3-1900
30592	21S-06W-16-010	466	LSR_KWS.Y	NO PAST STAND MGMT.		NO TREATMENT	ZZ D4D3-=1860
30618	21S-06W-22-010	116	LSR_KWS.Y	NO PAST STAND MGMT.		NO TREATMENT	ZZ D4=1860//D3-1890
		797			***		
		799 ***					
33597	21S-06W-27-777	2	MMR_KWS.N			NO TREATMENT	D4=1860//D3-1930
		2			***		
30636	21S-06W-27-020	62	MMR_KWS.N		PLANTED	NEEDS PCT	PL D1-=1968
30942	21S-07W-25-993	19	MMR_KWS.N		PLANTED	REG.W.GENETIC	PL D2-=1982

SITE...	TWP-RGE-SEC-UNIT	...UNIT ..ACRES	LUA.1K....	....COVER..CONDITION	EX.STAND.COND..	.ENTIRE.STAND.DESCRIPTION
30957	21S-07W-35-020	10	MMR_KWS.N	PLANTED	NEEDS PCT	PL D1-=1965
30958	21S-07W-35-030	57	MMR_KWS.N	PLANTED	NEEDS PCT	PL D2-=1962
30964	21S-07W-35-080	9	MMR_KWS.N	PLANTED	NEEDS PCT	PL D2-=1965
30965	21S-07W-35-090	19	MMR_KWS.N	PLANTED	NEEDS PCT	PL D1-=1965
31171	22S-07W-01-010	45	MMR_KWS.N	PLANTED	PCT'D/WELL SPCE	PL D1990
31175	22S-07W-01-060	43	MMR_KWS.N	PLANTED	PCT'D/WELL SPCE	PL D2-=1960
31177	22S-07W-01-080	38	MMR_KWS.N	PLANTED	PCT'D/WELL SPCE	PL D1991
31218	22S-07W-11-080	35	MMR_KWS.N	PLANTED	NEEDS PCT	PL D1-=1969
31219	22S-07W-11-090	23	MMR_KWS.N	PLANTED	ABOVE MIN. STK.	PL D2=1965
32130	21S-06W-31-070	44	MMR_KWS.N	PLANTED	PCT'D/WELL SPCE	PL D1-=1978
32131	21S-06W-31-080	34	MMR_KWS.N	PLANTED	PCT'D/WELL SPCE	PL D1-=1978
32132	21S-06W-31-090	36	MMR_KWS.N	PLANTED	NEEDS PCT	PL D1-=1979
32271	22S-07W-01-050	24	MMR_KWS.N	PLANTED	PCT'D/WELL SPCE	PL D1-=1976
33071	21S-06W-27-010	9	MMR_KWS.N	PLANTED	PCT'D/WELL SPCE	PL 1994
33075	21S-06W-27-090	44	MMR_KWS.N	PLANTED	PCT'D/WELL SPCE	PL D1990
33115	21S-07W-25-020	46	MMR_KWS.N	PLANTED	PCT'D/WELL SPCE	PL D1-=1985
33116	21S-07W-35-140	24	MMR_KWS.N	PLANTED	PCT'D/WELL SPCE	PL D1-=1986
33117	21S-07W-35-150	34	MMR_KWS.N	PLANTED	PCT'D/WELL SPCE	PL D1-=1986
33118	21S-07W-35-130	26	MMR_KWS.N	PLANTED	PCT'D/WELL SPCE	PL D1-=1986
33155	21S-06W-31-030	35	MMR_KWS.N	PLANTED	PCT'D/WELL SPCE	PL D1-=1975
33513	21S-06W-31-100	28	MMR_KWS.N	PLANTED	PCT'D/WELL SPCE	PL D1990
33514	21S-06W-31-110	30	MMR_KWS.N	PLANTED	PCT'D/WELL SPCE	PL D1991
33515	21S-06W-31-120	26	MMR_KWS.N	PLANTED	PCT'D/WELL SPCE	PL D1991
33596	21S-06W-27-110	30	MMR_KWS.N	PLANTED	PCT'D/WELL SPCE	PL 1994
		830		***		
31221	22S-07W-11-110	21	MMR_KWS.N	WATER/MARSH	NON-FOREST	NW
31244	22S-07W-15-090	16	MMR_KWS.N	WATER/MARSH	NON-FOREST	NW
		37		***		
30941	21S-07W-25-040	43	MMR_KWS.N	RESIDUAL STAND	NO TREATMENT	R D4-1857//D2-=1960
31174	22S-07W-01-040	25	MMR_KWS.N	RESIDUAL STAND	NO TREATMENT	R D4GF4-1780//D3GF3-=1950
		68		***		
33595	21S-06W-27-080	12	MMR_KWS.N	RECENT CLEARCUT	SP, NEED REGEN	X 1994
		12		***		
30659	21S-06W-31-050	12	MMR_KWS.N	NATURALLY STOCKED	NO TREATMENT	N D2=1940
30966	21S-07W-35-100	23	MMR_KWS.N	NATURALLY STOCKED	NO TREATMENT	N D3D2-=1930
31178	22S-07W-01-090	58	MMR_KWS.N	NATURALLY STOCKED	PCT'D/WELL SPCE	N GF3D-=1950
33120	21S-07W-35-110	11	MMR_KWS.N	NATURALLY STOCKED	NO TREATMENT	N D3=1940
		104		***		
30637	21S-06W-27-030	44	MMR_KWS.N	NO PAST STAND MGMT.	NO TREATMENT	ZZ D4-1830//D2HD2=1930
30638	21S-06W-27-040	311	MMR_KWS.N	NO PAST STAND MGMT.	NO TREATMENT	ZZ D4=1860//D3-1930
30656	21S-06W-31-010	256	MMR_KWS.N	NO PAST STAND MGMT.	NO TREATMENT	ZZ D4-=1860
30657	21S-06W-31-020	37	MMR_KWS.N	NO PAST STAND MGMT.	NO TREATMENT	ZZ D4-1860//D2=1940
30658	21S-06W-31-040	23	MMR_KWS.N	NO PAST STAND MGMT.	NO TREATMENT	ZZ D4-1870//D3=1930
30660	21S-06W-31-060	32	MMR_KWS.N	NO PAST STAND MGMT.	NO TREATMENT	ZZ D2-=1940

SITE...	TWP-RGE-SEC-UNIT	...UNIT ..ACRES	LUA.1K....	....COVER..CONDITION	EX.STAND.COND..	.ENTIRE.STAND.DESCRIPTION
30939	21S-07W-25-010	492	MMR_KWS.N	NO PAST STAND MGMT.	NO TREATMENT	ZZ D4-1780//D3=1900
30940	21S-07W-25-030	19	MMR_KWS.N	NO PAST STAND MGMT.	CT'D AT AGE 60	ZZ D3-=1923
30956	21S-07W-35-010	250	MMR_KWS.N	NO PAST STAND MGMT.	NO TREATMENT	ZZ D4=1880
30959	21S-07W-35-040	15	MMR_KWS.N	NO PAST STAND MGMT.	NO TREATMENT	ZZ D3=1930
30960	21S-07W-35-050	14	MMR_KWS.N	NO PAST STAND MGMT.	NO TREATMENT	ZZ D3-=1930
30961	21S-07W-35-060	56	MMR_KWS.N	NO PAST STAND MGMT.	NO TREATMENT	ZZ D4=1880
30962	21S-07W-35-070	37	MMR_KWS.N	NO PAST STAND MGMT.	NO TREATMENT	ZZ D3-=1930
31172	22S-07W-01-020	307	MMR_KWS.N	NO PAST STAND MGMT.	NO TREATMENT	ZZ D4-=1760
31179	22S-07W-01-100	22	MMR_KWS.N	NO PAST STAND MGMT.	NO TREATMENT	ZZ D4D3GF3-=1910
31211	22S-07W-11-010	8	MMR_KWS.N	NO PAST STAND MGMT.	NO TREATMENT	ZZ D4WF-1870//D3WF-1910
31212	22S-07W-11-020	110	MMR_KWS.N	NO PAST STAND MGMT.	NO TREATMENT	ZZ D2=1950
31214	22S-07W-11-040	59	MMR_KWS.N	NO PAST STAND MGMT.	NO TREATMENT	ZZ D4-1870//D2WF=1950
31217	22S-07W-11-070	94	MMR_KWS.N	NO PAST STAND MGMT.	NO TREATMENT	ZZ D4-1780//D3GF-=1950
31236	22S-07W-15-010	55	MMR_KWS.N	NO PAST STAND MGMT.	NO TREATMENT	ZZ D4=1890
33073	21S-06W-27-070	12	MMR_KWS.N	NO PAST STAND MGMT.	NO TREATMENT	ZZ D3-=1930
33119	21S-07W-35-071	23	MMR_KWS.N	NO PAST STAND MGMT.	NO TREATMENT	ZZ D2=1940
33121	21S-07W-35-120	5	MMR_KWS.N	NO PAST STAND MGMT.	CT'D AT AGE 60	ZZ D3-=1920
33476	22S-07W-01-777	10	MMR_KWS.N	NO PAST STAND MGMT.	NO TREATMENT	ZZ D4=1860
33516	21S-06W-31-777	16	MMR_KWS.N	NO PAST STAND MGMT.	NO TREATMENT	ZZ D4-1860
		2307		***		
33604	21S-07W-25-998	3	MMR_KWS.N	ROADS/MAINT.FACILITY	NON-FOREST	NH
		3		***		
		3363	***			
30947	21S-07W-27-030	37	RHA_KWS.N	SEEDED	NEEDS PCT	S D1=1967
		37		***		
30946	21S-07W-27-021	16	RHA_KWS.N	PLANTED	PCT'D/WELL SPCE	PL D2-=1964
		16		***		
30948	21S-07W-27-040	161	RHA_KWS.N	NO PAST STAND MGMT.	NO TREATMENT	ZZ D4-1870//D3H-1910
		161		***		
		214	***			
***		10701				

203 Records Processed

Feb. 6, 1995

Tom Folley
Watershed Analysis Unit
Aquatic Resources

Past forest management activities in the Tom Folley WAU, such as road building, clearcut logging, and broadcast burning, have extensively modified the watershed level forest hydrologic cycle. From hydrologic research and other watershed studies in the Coast and Western Cascade Ranges in Oregon, relatively accurate assumptions can be made that changes in streamflow and impacts to water quality have resulted from these activities.

I. Water Quality

The Oregon Department of Environmental Quality (DEQ) statewide assessment of stream quality conditions, published in 1988, identified and rated two beneficial uses in the Big Tom Folley basin: cold water fisheries, and other aquatic fauna. Water quality problems which interfere with these beneficial uses, by way of impacting the normal life history or composition of aquatic populations, were further identified in three areas: excessive nutrients; excessive sedimentation, and insufficient stream structure. Excessive nutrient loading reflects conditions of chemical imbalance, which leads to excessive plant growth and degradation of water quality for aquatic fauna. Excessive sedimentation is characterized by an accumulation of fine solids which impact fish and other aquatic fauna habitat. Insufficient stream structure indicates the presence of inadequate amounts of physical instream components (i.e. undercut streambanks, boulders, large woody debris, pools, riffles, etc.), which in turn reduce habitat complexity, channel stability, and flow-regulating characteristics of a stream to the detriment of fish and other aquatic fauna. These conditions are substantiated by recent Habitat Inventory Surveys conducted in the basin by the Oregon Department of Fish and Wildlife (refer to section III. Fisheries).

II. Roads and Culverts

In assessing how road building activities have impacted basin water quality, and affected basin hydrologic function and streamflow changes in the Tom Folley WAU, examination of the network of stream channels in relation to the network of roads is necessary. Table 1 identifies the distance in miles of all streams (first through seventh order) and roads (paved, gravel, and dirt) located in the WAU subbasins. While the noted stream miles are regardless of ownership patterns, the noted road miles only reflect roads existing on Federal land and some roads on private lands where the BLM retains a right-of-way agreement; other roads exist, therefore the displayed figures should be considered as rough estimates. The area of the basins covered with roads (%) was computed using an average road width of 40 feet. Potential increase relates to the potential expansion of the subbasin stream channel networks by roads.

Table 1 - Subbasin Stream and Road Relational Data

Subbasin	Stream miles	Road miles	% Basin roaded	% Potential increase
Little Tom	63.78	23.59	2.4	37
Lower Tom	32.14	10.86	2.0	34
Saddle Butte	19.36	9.66	3.0	50
North Fork	41.15	14.43	2.1	35
Big Tom	34.65	12.28	1.8	35
Smith Folley	24.55	6.72	1.6	27
Folley Headwater	31.32	10.86	2.1	34
Tom Folley WAU	246.95	88.40	2.1	36

Further analysis of how roads potentially influence basin hydrologic function and streamflow changes must consider road location relative to hillslope position, and the types of road surfacing (Table 2). Road location relative to hillslope position has been shown to affect both the volume and timing of water delivery to natural channels (Wemple 1994).

Table 2 - Distribution of Road Positions in Subbasins

Subbasin	Location[1]	% Occur.	% Asphalt	% Gravel	% Dirt
Little Tom					
	RT	30	16	67	16
	MS	44	0	43	57
	VB	26	0	52	48
Lower Tom					
	RT	11	0	50	50
	MS	46	0	6	94
	VB	43	0	81	19
Saddle Butte					
	RT	48	36	21	43
	MS	35	60	10	30
	VB	17	0	80	20
North Fork					
	RT	46	4	83	13
	MS	30	0	27	73
	VB	24	0	83	17
Big Tom					
	RT	45	0	75	25
	MS	20	0	22	78
	VB	35	0	60	40
Smith Folley					
	RT	58	0	93	7
	MS	4	0	100	0
	VB	38	0	56	44
Folley Headwaters					
	RT	31	0	82	18
	MS	50	0	28	72
	VB	19	0	71	29

1. RT = ridge top, MS = midslope, VB = valley bottom

Certain functions can be anticipated from road construction in any hillslope location:

> Removal of surface vegetation decreases interception of precipitation and delivers more water directly to the forest floor; infiltration of precipitation into the soil is reduced because of compaction; if the soil becomes saturated, overland flow can result and become directed into ditchlines, onto road margins where soil infiltration occurs, or downhill on the road surface; flow directed into ditchlines is drained through culverts, where it may infiltrate, enter natural channels, or create new channels.
>
> Interception of subsurface flow can increase along road cutbanks, producing flow into ditchlines; this flow is drained through culverts, where it may infiltrate, enter natural channels, or create new channels.

As a result of these functions, the time to deliver and volume of runoff from valley bottom, midslope, and ridgetop roads to natural channels is distinctly faster and greater, respectively, than the timing and volume of precipitation naturally routed through an undisturbed basin (Harr 1976; Jones and Grant 1993; Wemple 1994). The effects of this difference in routing are numerous. Earlier peak flows and related higher magnitude peak flows can result from the increased efficiency in routing. A subsequent increase in channel scour can occur, and can drastically change the natural instream characteristics. Effects directly related to this increase in flow and scour include the removal of large woody debris (LWD) and gravel, simplification of stream habitat, increased width:depth ratios, and augmentation of the instream sediment regime with fine sediments. Instream habitat inventories of streams in the WAU have revealed some of these characteristics: bedrock dominated stream channels, low percentages and infrequent distribution of gravel, relatively high percentages of actively eroding streambanks, simplified stream margin habitat, high width:depth ratios, and high percentages of fine sediments in riffles.

Considered in this analysis are two types of culverts: (1) ditch-relief culverts, designed to discharge surface runoff from the roadside ditch to the hillslope below the road and (2) stream-crossing culverts, placed where the road crosses a stream channel. At the time of this analysis, a basin-wide investigation of the effects of these types of culverts has not been conducted in the Tom Folley WAU. In the absence of this information, however, relatively accurate assumptions can be made from previous research (Wemple, 1994) on the effects of forest roads and their associated drainage systems (culverts). These studies provide evidence that forest roads and culverts interact with the naturally occurring channel network to modify surface flowpaths and discharge road runoff and associated sediment directly into streams. Limited field observations in the Tom Folley WAU suggest that portions of the current drainage system are in need of maintenance, repair, or replacement. Lack of maintenance has caused several ditch-relief culverts to become obstructed with fine sediments and organic material, making them ineffective in properly draining the ditchlines.

By not draining the ditchline at these designated points, the water accumulated in the ditchline is passed downward to the next ditch-relief culvert. In such cases, the concentrated water is prone to scour out the ditchline, causing fine sediments to be suspended in the water column. If no other ditch-relief culverts exist down the ditchline, this water most often forms pools, flows across the road, or is delivered to a natural channel via the ditchline. There are observed instances where concentrated water exiting from ditch-relief culverts incises new channels below the culvert outlet, forms scour pools, and overland flow occurs. These new channels lead to natural channels, and are more often than not laden with suspended solids. Where ditch-relief culverts are oversized in length (this variety is commonly referred to as a "cannon culvert"), the result is an elevated outlet that delivers water with enough velocity to form a scour pool. During times of heavy runoff, fine sediments are suspended and become readily transportable. There are observed cases where this water is consequently delivered directly to a natural channel.

While these observed cases are limited in number, it is credible to infer that there are similar situations occurring throughout the Tom Folley WAU. It can suffice to say that not only do the ditch-relief culverts placed throughout the WAU change the timing and volume of water delivered to natural channels, they are also likely responsible for delivering an unnatural amount of fine sediments to the natural channels in the WAU.

In regard to stream-crossing culverts, a preliminary assessment was conducted to determine their distribution in each of the Tom Folley WAU subbasins (Table 3).

Table 3 - Distribution of Stream Crossing Culverts

Subbasin	Mainstem culvert	Tributary culvert	Total
Little Tom	2	32	34
Lower Tom	0	8	8
Saddle Butte	3	3	6
North Fork	4	9	13
Big Tom	2	9	11
Smith Folley	3	8	11
Folley Headwater	1	6	7
Total	15	75	90

The assessment was conducted using GIS generated maps showing roads and streams. Further detailed field examinations are necessary to assess the condition and structural integrity of the stream-crossing culverts. A majority of these culverts were placed at a time when guidelines associated with culvert placement emphasized water routing more so than fish passage. Many were constructed to handle a peak flow with a 25-year recurrence interval. Current federal guidelines are much more stringent, particularly in regard to peak flow design criteria. The current standard for stream-crossing culverts require that they handle peak flows with an 100-year recurrence interval. Problems that exist with the current smaller sized culverts include the possibility of becoming obstructed with debris, flooding the road during periods of runoff exceeding the capacity of the culvert, restricting the downstream transportation of debris and coarse substrates, and potentially inhibiting passage of fish.

It is worthy to note another road-related impact that has been documented in past studies, but not entirely investigated in the Tom Folley WAU. Road construction in the valley bottom can eliminate or separate off-channel hydrologic features from the main channel, and restrict channel meandering. It is difficult to form a clear picture of the channel forms and conditions that existed in the WAU prior to road construction. Based on the topography of the valley bottoms, assumptions can be made that off-channel hydrologic features, such as backwaters, alcoves, and secondary channels, were distributed frequently throughout the WAU. These hydrologic features currently represent only six percent of the Tom Folley basin (ODFW 1994). One of the primary consequences of separating off-channel hydrologic features from the main channel is the reduced capability of the main channel to store water associated with high runoff events. Reduced retention of flood waters can elevate peak flows, produce channel scouring, transport coarse substrate off-site, remove or redistribute large woody debris (LWD), and increase the potential for downstream flooding. The elimination of off-channel features and the resultant processes can also impact the basin fishery and other aquatic fauna.

Restricted channel meandering within the WAU can be inferred based on preliminary field observations and information from habitat inventories, which hint of low stream sinuosity values. Restricted meandering has the effect of routing stream water faster through the basin, which in turn can cause earlier and higher magnitude peak flows. Resultant processes are similar to those noted in the paragraph above, and would also be detrimental to the basin fishery and other aquatic fauna.

III. Timber Harvest

Past logging practices have likely had impacts on the hydrologic functions within the WAU. Aerial photography dating back to 1965 show clearcut harvest units that extend from the stream channels to ridgetops. Downhill cable logging appears to have been a frequently employed method of harvest. Haul roads, skid trails, log decks, and landings were commonly placed in or within the floodplains. Stream buffers were generally not applied. Denudation of the slopes was often accompanied by the removal of the forest canopy over intermittent and perennial streams. The results of these actions were likely to increase sediment delivery to the natural channels, and elevate instream water temperatures.

Snowfall in the Tom Folley basin is infrequent. There are no areas in the WAU that occur in the designated transient snow zone (from 2000 to 5000 feet in elevation). However, when weather conditions exist to produce snowfall over the WAU, accumulation of snow in harvested units is increased relative to undisturbed or regenerated forest. Rapid melting of these relatively shallow snowpacks during rainfall can result in higher rates of water input to the soil, increased surface runoff and associated sediment transport, and increased peak flows (Harr 1986). These processes diminish as harvest units regenerate. Their effect on basin hydrology, and their impacts to basin aquatic ecology are adequately described in preceding sections of this report. Since snowfall in the basin is sporadic, the effects of rain-on-snow processes likely do not play a large role in basin channel formation.

IV. Fisheries

The basin streams are used extensively by anadromous and resident salmonids. Many of these salmonids, excluding chinook salmon, possess "special status". Umpqua cutthroat trout are currently proposed for listing under the Endangered Species Act (ESA). Oregon coastal coho salmon and winter steelhead are currently petitioned for listing under the ESA. Additionally, the Oregon Department of Fish and Wildlife (ODFW) recognizes these taxa as either Stocks of Concern or Sensitive Species. Other fish species present include dace, sculpin, and lamprey. Of these, Pacific Lamprey are recognized by the ODFW as a Sensitive Species.

All of these fish utilize stream orders 7 through 4 for rearing and migration up and down stream. Chinook, coho, steelhead, and fluvial/anadromous cutthroat spawning is largely in fourth and third order streams, while resident cutthroat trout are more likely to utilize third and second order streams. These generalities are of course limited to whether or not there is suitable/functional habitat for all the salmonid lifeforms, in their varying stages of development. Suitable habitat throughout the basin is considered to be limited by the following factors, as identified by 1993 ODFW Habitat Inventory Surveys:

- lack of deep residual pools
- lack of instream large woody debris (LWD)
- high amounts of sediment in riffles
- lack of spawning gravels
- substrate dominated by bedrock
- riparian zones dominated by alder

These limitations adversely affect the spawning and rearing activities of anadromous and resident salmonids, and are largely the result of past and present human disturbances, most notably road construction and clear-cut timber harvests (Meehan, 1991). High amounts of sediment in riffles can assumably be traced to the sediments delivered to natural channels via ditch-relief culverts and ditchlines, and can also be remnants of past natural or human caused landslides. The lack of deep residual pools is related to increased sediment delivery, as these sediments are often deposited in pools as flows recede following periods of high runoff. Lack of spawning gravels, substrate dominated by bedrock, and simplified stream habitat are closely related to higher magnitude peak flows. These limitations are interrelated to the lack of instream large woody debris (LWD) and the fact that a majority of the fish bearing riparian areas are dominated by alder. Instream LWD recruited from the riparian zone plays a vital role in maintaining the ecology of streams by reducing water velocity, creating deep scour pools, retaining gravel, and providing habitat complexity. Coniferous instream LWD, and the recruitment of such, is lacking primarily because of past timber harvests and salvages in the riparian zones. Dense alder stands are currently widespread throughout the fish bearing riparian areas in the WAU, and create understory shade conditions that effectively inhibit the establishment of conifers.

The elimination or separation of off-channel habitat types (i.e. secondary channels, alcoves, and backwaters) from road construction in the floodplain has removed areas that are vitally important to juvenile salmonids for rearing habitat. Two examples of this situation have been identified, but with numerous miles of valley bottom roads in the WAU, it is credible to infer that with further field studies, other isolated off-channel features could be found.

Accurate records of historical fish distribution are somewhat lacking (refer to Map A). Anecdotal information and fish distribution surveys conducted in 1975 are useful for site specific conditions, but do not provide much more information in identifying the distribution of fish throughout the basin. Fish distribution throughout the basin has likely been impacted from the placement of stream-crossing culverts. While many of these culverts are adequately designed to allow upstream migration of adult salmonids, most of these culverts inhibit downstream migration of juvenile salmonids.

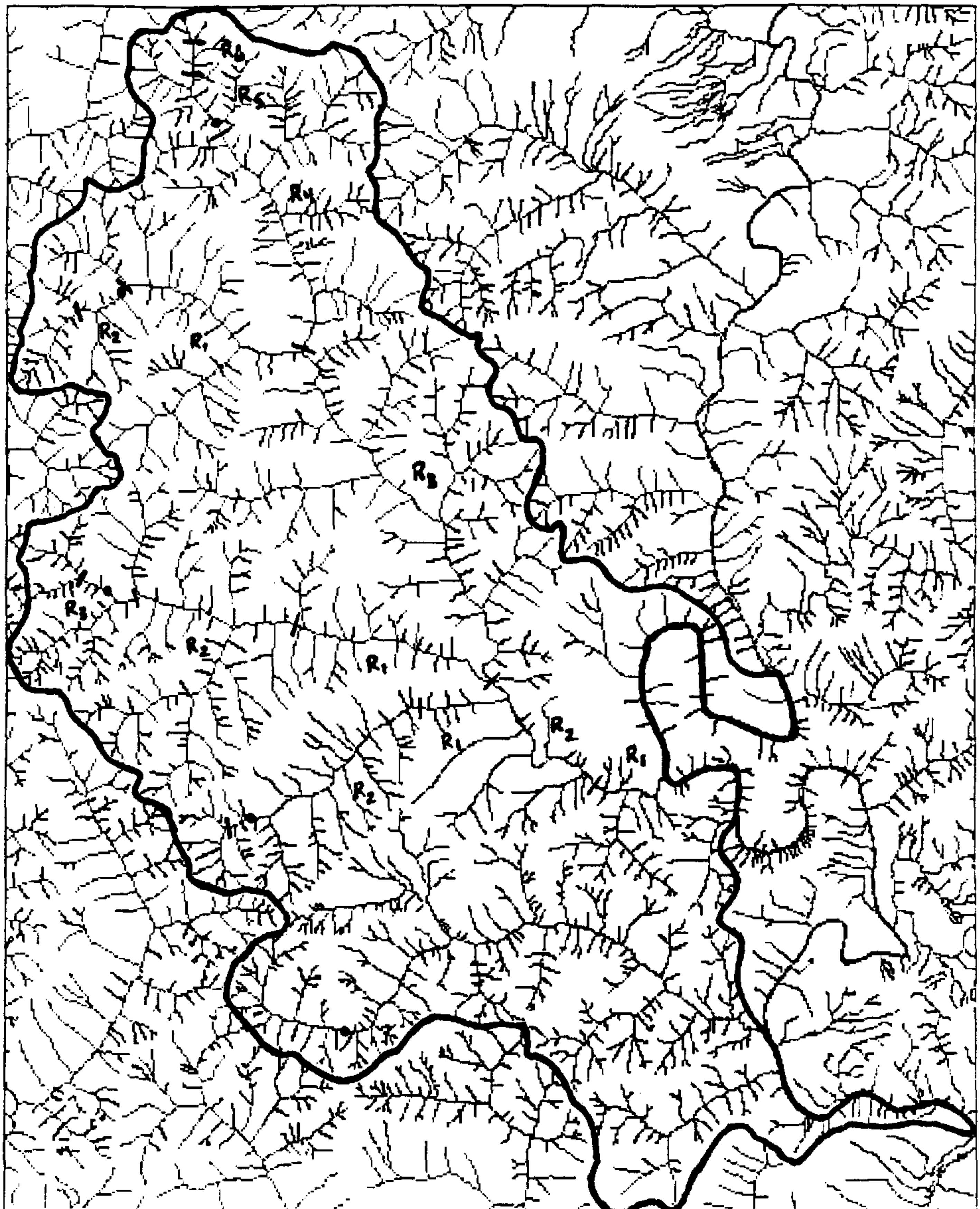
Information from ODFW Habitat Inventory Surveys conducted in 1993 have been summarized and tabulated to illustrate the observed habitat conditions (refer to Stream Habitat Characteristics tables and Stream Habitat Benchmark worksheets in Appendix A). No habitat inventory information for Little Tom Folley creek is available at this time, although Little Tom was surveyed during the summer of 1994 and a report from ODFW is anticipated in the spring of 1995.

Stream temperatures were monitored in the North Fork subbasin during the summer of 1994. From the data collected, the hottest days of the year occurred in the seven day period of July 17-23 (refer to graph, Lower North Fork Tom Folley). The maximum recorded temperature was approximately 66° F; the minimum temperature during the same period was approximately 56° F; average maximum was 64.6° F. Diurnal stream fluctuations during this time were approximately 6° F. These temperatures are 8 to 12° F greater than temperatures considered to be optimum for most salmonids (Meehan 1991). Temperatures during this period of time would cause most salmonids in the study area to seek cooler water either in reaches up or down stream, or in pools with deep, cooler water. It is not anticipated, nor indicated in the data collected, that these higher temperatures are sustained throughout the summer. Recent instream temperature studies in another Elk Creek tributary, Brush Creek, during the summer of 1994 showed that water temperatures were lower in the upper reaches of the basin, and gradually increased in the lower reaches. The same function can be assumed to occur in the Tom Folley WAU. Further temperature monitoring would be required to ascertain whether or not there are reaches in the basin which attain temperatures that are unsuitable or lethal to salmonids. Field surveys of the riparian areas in the basin reveal reaches that are not well shaded; this would lead to relatively accurate assumptions that there are reaches within the basin that are thermal barriers to salmonids. Additionally, the general lack of deep residual pools, which function as cool water refugia during the hottest periods of the year, can limit the distribution and productivity of salmonids throughout the basin.

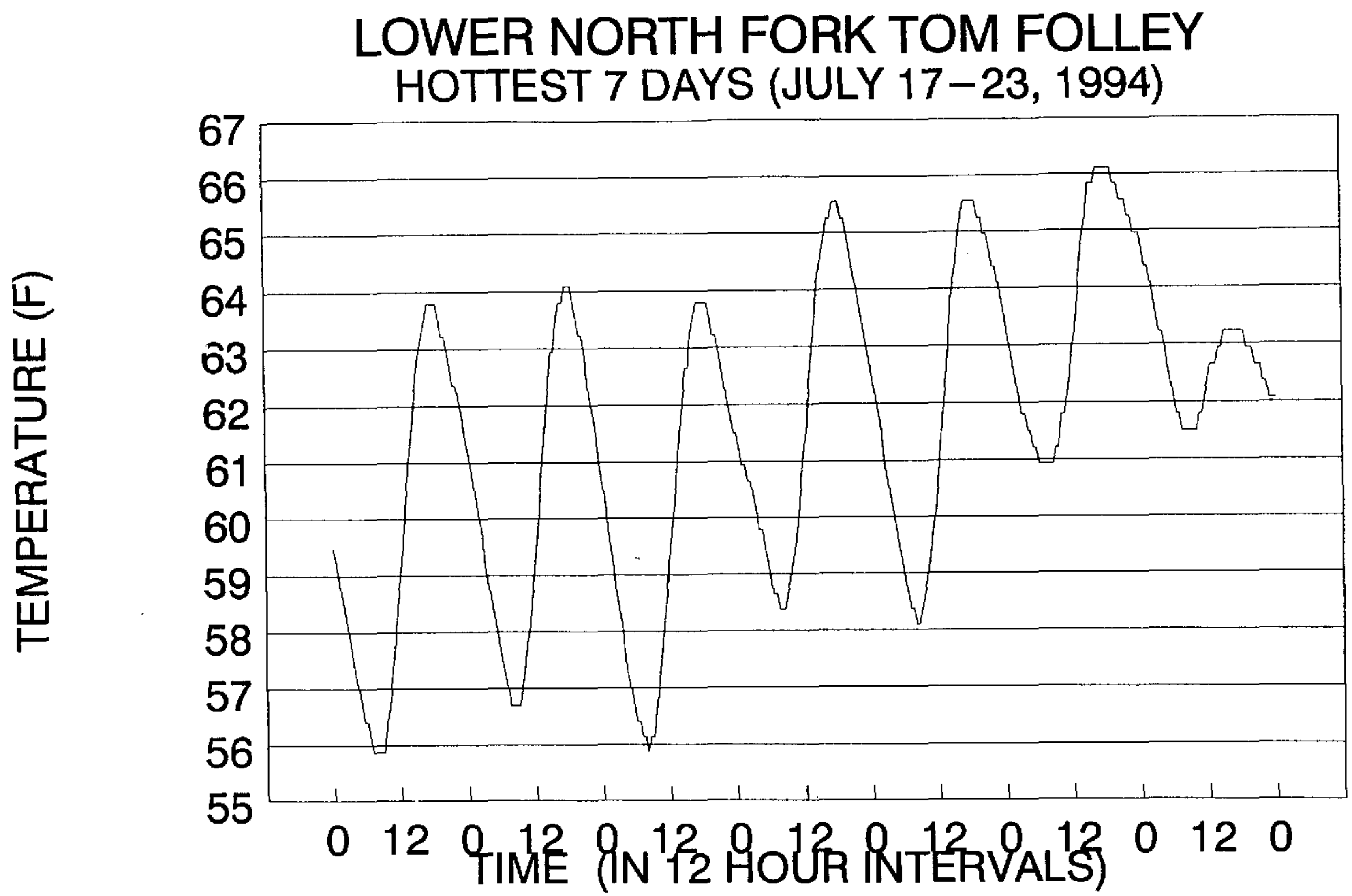
If instream habitat restoration projects are implemented, they should focus on restoring or maintaining specific instream habitat requirements, keeping in mind that particular taxa have differing habitat requirements. Priority for restoration should be given to the reaches that presently are of the highest quality, or could quickly attain a level of high quality. Additionally, efforts to restore instream fish habitat should be performed in conjunction with an appropriate amount of upland restoration.

MAP A

TOM FOLLEY WAU
FISH DISTRIBUTION (Estimated)



ODFW REACH BREAK



LOWER NORTH FORK TOM FOLLEY
HOTTEST 7 DAYS (JULY 17–23, 1994)
TEMPERATURE (F)
67
66
65
64
63
62
61
60
59
58
57
56
55
0 12 0 12 0 12 0 12 0 12 0 12 0 12 0
TIME (IN 12 HOUR INTERVALS)

V. Macroinvertebrates

An analysis of macroinvertebrate composition and diversity was conducted on both Big Tom Folley creek and Little Tom Folley creek in the late spring of 1982. The Big Tom Folley sample indicated that this portion of the stream had a diverse community of aquatic macroinvertebrates. Taxa present indicated good water quality, good riparian habitat, and some suitable spawning substrate for salmonids. While there was a good trophic balance in the macroinvertebrate community, an indexed value indicated that the aquatic ecosystem was not in as good a condition as it could have been. There were indicator taxa collected that reflect sedimentation problems. In the Little Tom Folley sample, macroinvertebrate community composition within the sampling area indicated good water quality and instream habitat, and some suitable spawning substrate. The indexed value for this sample was higher than the Big Tom sample, indicating that the Little Tom aquatic ecosystem in the vicinity of the sampling area was in better condition. In both cases, management options recommended were to simply maintain the existing instream qualities. No other macroinvertebrate studies have been conducted in the WAU.

Identified impacts to macroinvertebrates in the WAU are directly related to processes and mechanisms described in previous sections, particularly elevated peak flows and excessive sedimentation.

The information from the 1982 samples is useful as an indicator of site specific instream habitat and water conditions at that time, but should not be used to characterize the overall conditions in the Tom Folley basin. Certain limitations are associated with this data. Many of the taxa identified were not keyed out completely, which makes the assumptions about the relationships between intolerant taxa and good water quality somewhat inaccurate. Sampling was not repeated during different times of the year, particularly during the late summer during lowest flows, when samples could have identified taxa associated with poor water quality or assemblages of taxa that reflect a more disturbed aquatic ecosystem. The samples were collected from one riffle habitat, which can bias the results by not sampling for taxa from a variety of other habitat types.

The following management suggestions are presented with the intention to restore and maintain the quality of the aquatic ecosystems in the Big Tom Folley WAU.

I. WATER QUALITY

Continue or begin monitoring identified impacts to beneficial uses in basin (i.e. temperature, suspended sediments).

Identify specific projects to restore natural functions and processes.

Continue temperature monitoring to develop baseline for future project implementation.

II. ROADS AND CULVERTS

Consider the obliteration of existing unused roads.

- Focus on subbasins with the highest road densities, then on subbasins with the highest percentage of dirt roads.

Rock existing dirt roads.

Maintain, repair, or replace culverts throughout the basin.

- Perform basin-wide culvert surveys.
- Assess the suitability of using alternative stream-crossing structures on all culvert replacement projects.
- Design all stream-crossing structures to handle peak flows with recurrence intervals of 100 years.
- Replace "cannon culverts", or install downspouts and/or rip-rap below the outlet to dissipate water velocity.
- Increase the density of ditch-relief culverts on all roads at all hillslope locations, in conjunction with road maintenance projects.
- Perform scheduled road maintenance, with particular attention to ensuring road ditchlines are functioning properly.

III. TIMBER HARVEST

Follow existing ROD Standards and Guidelines in implementing timber harvest, according to determined land use allocations.

Utilize silvicultural methods (alder girdling, brush cutting, tree planting) to reestablish conifers in riparian areas dominated by alder.

IV. FISHERIES

Conduct fish distribution surveys throughout the basin.

Utilize ODFW habitat inventory data and conduct site-specific instream surveys to identify stream reaches that exhibit limiting conditions (lacking in pool habitat, gravel substrate, and LWD; high W:D ratios) and assess suitability for restoration.

Priority Reaches:

Big Tom Folley:	1 2 3
North Fork:	3
Saddle Butte:	1
Tributary A:	1 2

Utilize placement of instream structures to provide complex habitat, gravel aggradation, pool habitat, and smaller W:D ratios.

V. MACROINVERTEBRATES

Conduct systematic macroinvertebrate surveys throughout the Tom Folley basin periodically, to monitor positive or negative trends in the basin aquatic ecosystem.

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APPENDIX A

1) STREAM HABITAT CHARACTERISTICS TABLES

2) STREAM HABITAT BENCHMARK WORKSHEETS

Big Tom Folley WAU Stream Habitat Characteristics

ODFW Stream Name (BLM Subwatershed)	Reach	Order	Length(m)	Length(%)	Pools(%)	LWD(vol./100m)
Big Tom Folley (Lower Tom Folley)	1	4	1052.0	9	14	4.4
Big Tom Folley (Lower Tom Folley)	2	4	1817.0	15	29	3.4
Big Tom Folley (Big Tom Folley)	3	3	4587.0	37	51	13.0
Big Tom Folley (Folley Headwater)	4	2	3372.0	27	44	25.3
Big Tom Folley (Folley Headwater)	5	1	1284.0	10	18	41.3
Big Tom Folley (Folley Headwater)	6	1	277.0	2	0	0.0
			12389.0			
North Fork	1	3	3378.0	62	30	15.0
North Fork	2	2	1343.0	24	41	30.8
North Fork	3	2	771.0	14	17	10.9
			5492.0			
Saddle Butte	1	2	1177.0	28	39	7.5
Saddle Butte	2	2	3080.0	72	65	24.6
			4257.0			
Tributary A (Smith Folley)	1	2	2662.0	77	40	3.9
Tributary A (Smith Folley)	2	1	778.0	23	2	9.5
			3440.0			

Big Tom Folley WAU Stream Habitat Characteristics

ODFW Stream Name (BLM Subwatershed)	Reach	Pool Depth(m)	Riffle W/D	Riffle Gravel(%)	Riffle Fines(%)	Substrate (dom. %)	Canopy (dom.)
Big Tom Folley (Lower Tom Folley)	1	0.46	15	34	17	gravel 44	alder
Big Tom Folley (Lower Tom Folley)	2	0.56	31	71	4	gravel 54	alder
Big Tom Folley (Big Tom Folley)	3	0.29	32	39	5	bdrock 39	alder
Big Tom Folley (Folley Headwater)	4	0.23	28	49	8	gravel 37	alder
Big Tom Folley (Folley Headwater)	5	0.17	17	33	15	gravel 46	conifer
Big Tom Folley (Folley Headwater)	6	0.00	–	–	–	–	–
North Fork	1	0.31	39	69	12	bdrock 35	alder
North Fork	2	0.28	29	71	13	gravel 45	alder
North Fork	3	0.18	13	60	33	gravel 39	alder
Saddle Butte	1	0.23	16	40	16	bdrock 43	alder
Saddle Butte	2	0.25	23	45	11	*g/c/b 24	conifer
Tributary A (Smith Folley)	1	0.29	41	53	8	gravel 38	ald/con
Tributary A (Smith Folley)	2	0.15	–	44	16	gravel 44	con/ald

STREAM HABITAT BENCH MARKS

Stream name: ____________________

Reach number: _______

Ranking: __________________________

	scale	CAT. 1 (82-100) exc. 4	CAT. 2 (81-63) good 3	CAT. 3 (62-44) fair 2	CAT. 4 (43-31) poor 1	Total
% Pool area	2	>44	30-44	16-29	<16	
Residual pool depth (m)	4					
small (order 1-3)		>0.59	0.41-0.59	0.21-0.40	<0.21	
large (order 4+)		>0.99	0.76-0.99	0.51-0.75	<0.51	
Riffle W/D (wetted)	3	<11	11-20	21-29	>29	
Riffle S/S/O %	2	<2	2-7	8-14	>14	
Riffle gravel %	3	>80	30-79	16-29	<16	
Substrate dominant %	3	gravel	cobble	cobble	bedrock	
Substrate subdom. %	2	cobble	l.boulder	s.boulder	other	
Canopy spp. (dom./codom.)	2	conifer	conifer hardwood	hardwood conifer	alder	
Conifer size class (cm)	3	>90	50-90	15-49	<15	
Shade %	1	>79	71-79	61-70	<61	
LWD: pieces/100m	3	>30	20-30	11-19	<11	
LWD: vol./100m	2	>40	30-40	21-29	<21	
Temperature (F)	1	<56	56-60	61-69	>69	

Total: _______

STREAM HABITAT BENCH MARKS

Stream name: BIG TOM FOLLEY
Reach number: 1
Ranking: CATEGORY 3 (FAIR)

	scale	CAT. 1 (82-100) exc. 4	CAT. 2 (81-63) good 3	CAT. 3 (62-44) fair 2	CAT. 4 (43-31) poor 1	Total
% Pool area	2				14.4	2
Residual pool depth (m)	4					
small (order 1-3)						
large (order 4+)					0.46	4
Riffle W/D (wetted)	3		14.5			9
Riffle S/S/O %	2				17	2
Riffle gravel %	3		34			9
Substrate dominant %	3	44 GRAVEL				12
Substrate subdom. %	2				20 SAND	2
Canopy spp. (dom./codom.)	2				ALDER	2
Conifer size class (cm)	3				0	3
Shade %	1	87				1
LWD: pieces/100m	3			12.4		6
LWD: vol./100m	2				4.4	2
Temperature (F)	1	54.9				4

Total: 58

STREAM HABITAT BENCH MARKS

Stream name: BIG TOM FOLLEY
Reach number: 2
Ranking: CATEGORY 2 (GOOD)

	scale	CAT. 1 (82-100) exc. 4	CAT. 2 (81-63) good 3	CAT. 3 (62-44) fair 2	CAT. 4 (43-31) poor 1	Total
% Pool area	2			28		4
Residual pool depth (m)	4					
small (order 1-3)						
large (order 4+)				0.56		8
Riffle W/D (wetted)	3				31	3
Riffle S/S/O %	2		4			6
Riffle gravel %	3		71			9
Substrate dominant %	3	54 GRAVEL				12
Substrate subdom. %	2	15 COBBLE			15 BEDROCK	5
Canopy spp. (dom./codom.)	2				ALDER	2
Conifer size class (cm)	3				Ø	3
Shade %	1	93				4
LWD: pieces/100m	3				8.1	3
LWD: vol./100m	2				3.4	2
Temperature (F)	1		56.8			3

Total: 64

STREAM HABITAT BENCH MARKS

Stream name: BIG TOM FOLLEY
Reach number: 3
Ranking: CATEGORY 2 (GOOD)

	scale	CAT. 1 (82-100) exc. 4	CAT. 2 (81-63) good 3	CAT. 3 (62-44) fair 2	CAT. 4 (43-31) poor 1	Total
% Pool area	2	51				8
Residual pool depth (m)	4					
small (order 1-3)				0.29		8
large (order 4+)						
Riffle W/D (wetted)	3				32	3
Riffle S/S/O %	2		5			6
Riffle gravel %	3		39			9
Substrate dominant %	3				39 BEDROCK	3
Substrate subdom. %	2	24 GRAVEL				8
Canopy spp. (dom./codom.)	2				ALDER	2
Conifer size class (cm)	3				0	3
Shade %	1	98				4
LWD: pieces/100m	3			11.9		6
LWD: vol./100m	2				13.0	2
Temperature (F)	1	55.9				4

Total: 66

STREAM HABITAT BENCH MARKS

Stream name: BIG TOM FOLLEY
Reach number: 4
Ranking: CATEGORY 2 (GOOD)

	scale	CAT. 1 (82-100) exc. 4	CAT. 2 (81-63) good 3	CAT. 3 (62-44) fair 2	CAT. 4 (43-31) poor 1	Total
% Pool area	2		44			6
Residual pool depth (m)	4					
small (order 1-3)				0.23		8
large (order 4+)						
Riffle W/D (wetted)	3			28		6
Riffle S/S/O %	2			8		4
Riffle gravel %	3		49			9
Substrate dominant %	3	57 GRAVEL				12
Substrate subdom. %	2	25 COBBLE				8
Canopy spp. (dom./codom.)	2				ALDER	2
Conifer size class (cm)	3				0	3
Shade %	1	99				4
LWD: pieces/100m	3			18.1		6
LWD: vol./100m	2			25.3		4
Temperature (F)	1	55.4				4

Total: 76

STREAM HABITAT BENCH MARKS

Stream name: BIG TOM FOLLEY
Reach number: 5
Ranking: CATEGORY 1 (EXCELLENT)

	scale	CAT. 1 (82-100) exc. 4	CAT. 2 (81-63) good 3	CAT. 3 (62-44) fair 2	CAT. 4 (43-31) poor 1	Total
% Pool area	2			18		4
Residual pool depth (m)	4					
small (order 1-3)					0.17	4
large (order 4+)						
Riffle W/D (wetted)	3		17			9
Riffle S/S/O %	2				15	2
Riffle gravel %	3		33			9
Substrate dominant %	3	46 GRAVEL				12
Substrate subdom. %	2	26 COBBLE				8
Canopy spp. (dom./codom.)	2	CONIFER				8
Conifer size class (cm)	3			<50		6
Shade %	1	100				4
LWD: pieces/100m	3			17.2		6
LWD: vol./100m	2	41.3				8
Temperature (F)	1	53.6				4

Total: 84

STREAM HABITAT BENCH MARKS

Stream name: SADDLE BUTTE
Reach number: 1
Ranking: CATEGORY 2 (GOOD)

	scale	CAT. 1 (82-100) exc. 4	CAT. 2 (81-63) good 3	CAT. 3 (62-44) fair 2	CAT. 4 (43-31) poor 1	Total
% Pool area	2		39			6
Residual pool depth (m)	4					
small (order 1-3)				0.23		8
large (order 4+)						
Riffle W/D (wetted)	3		16			9
Riffle S/S/O %	2				16	2
Riffle gravel %	3		40			9
Substrate dominant %	3				43 BEDROCK	3
Substrate subdom. %	2	15 COBBLE				8
Canopy spp. (dom./codom.)	2				ALDER	2
Conifer size class (cm)	3		<90			9
Shade %	1	99				4
LWD: pieces/100m	3				9.1	3
LWD: vol./100m	2				7.5	2
Temperature (F)	1		59			3

Total: 68

STREAM HABITAT BENCH MARKS

Stream name: SADDLE BUTTE
Reach number: 2
Ranking: CATEGORY 2 (GOOD)

	scale	CAT. 1 (82-100) exc. 4	CAT. 2 (81-63) good 3	CAT. 3 (62-44) fair 2	CAT. 4 (43-31) poor 1	Total
% Pool area	2			25		4
Residual pool depth (m)	4					
small (order 1-3)				0.25		8
large (order 4+)						
Riffle W/D (wetted)	3			23		6
Riffle S/S/O %	2			11		4
Riffle gravel %	3		45			9
Substrate dominant %	3		24 GRAVEL COBBLE BOULDER			9
Substrate subdom. %	2				9 SAND	2
Canopy spp. (dom./codom.)	2		CONIFER			6
Conifer size class (cm)	3		< 90			9
Shade %	1	95				4
LWD: pieces/100m	3			19.3		6
LWD: vol./100m	2				20	2
Temperature (F)	1		59			3

Total: 72

STREAM HABITAT BENCH MARKS

Stream name: N. FORK TOM FOLLEY
Reach number: 1
Ranking: CATEGORY 3 (FAIR)

	scale	CAT. 1 (82-100) exc. 4	CAT. 2 (81-63) good 3	CAT. 3 (62-44) fair 2	CAT. 4 (43-31) poor 1	Total
% Pool area	2		30.3			6
Residual pool depth (m)	4					
small (order 1-3)				0.31		8
large (order 4+)						
Riffle W/D (wetted)	3				39	3
Riffle S/S/O %	2			12		4
Riffle gravel %	3		69			9
Substrate dominant %	3				35 BEDROCK	3
Substrate subdom. %	2	25 GRAVEL				8
Canopy spp. (dom./codom.)	2				ALDER	2
Conifer size class (cm)	3				0	3
Shade %	1	99				4
LWD: pieces/100m	3			11		6
LWD: vol./100m	2				15	2
Temperature (F)	1	53.6				4

Total: 62

STREAM HABITAT BENCH MARKS

Stream name: N. FORK TOM FOLLEY
Reach number: 2
Ranking: CATEGORY 1 (EXCELLENT)

	scale	CAT. 1 (82-100) exc. 4	CAT. 2 (81-63) good 3	CAT. 3 (62-44) fair 2	CAT. 4 (43-31) poor 1	Total
% Pool area	2		41			6
Residual pool depth (m)	4					
small (order 1-3)				0.28		8
large (order 4+)						
Riffle W/D (wetted)	3			29		6
Riffle S/S/O %	2			13		4
Riffle gravel %	3		71			9
Substrate dominant %	3	45 GRAVEL				12
Substrate subdom. %	2	26 COBBLE				8
Canopy spp. (dom./codom.)	2				ALDER	2
Conifer size class (cm)	3			<50		6
Shade %	1	99				4
LWD: pieces/100m	3			14.7		6
LWD: vol./100m	2	30.8				8
Temperature (F)	1	55.4				4

Total: 83

STREAM HABITAT BENCH MARKS

Stream name: N. FORK TOM FOLLEY
Reach number: 3
Ranking: CATEGORY 2 (GOOD)

	scale	CAT. 1 (82-100) exc. 4	CAT. 2 (81-63) good 3	CAT. 3 (62-44) fair 2	CAT. 4 (43-31) poor 1	Total
% Pool area	2			17		4
Residual pool depth (m)	4					
small (order 1-3)					0.18	4
large (order 4+)						
Riffle W/D (wetted)	3		13			9
Riffle S/S/O %	2				33	2
Riffle gravel %	3		60			9
Substrate dominant %	3	39 GRAVEL				12
Substrate subdom. %	2	26 COBBLE				8
Canopy spp. (dom./codom.)	2				ALDER	2
Conifer size class (cm)	3			<50		6
Shade %	1	100				4
LWD: pieces/100m	3				10.6	3
LWD: vol./100m	2				10.9	2
Temperature (F)	1	53.6				4

Total: 69

STREAM HABITAT BENCH MARKS

Stream name: TRIB. A, BIG TOM FOLLEY (SMITH FOLLEY)
Reach number: 1
Ranking: CATEGORY 2 (GOOD)

	scale	CAT. 1 (82-100) exc. 4	CAT. 2 (81-63) good 3	CAT. 3 (62-44) fair 2	CAT. 4 (43-31) poor 1	Total
% Pool area	2		40			6
Residual pool depth (m)	4					
small (order 1-3)				0.29		8
large (order 4+)						
Riffle W/D (wetted)	3				41	3
Riffle S/S/O %	2			8		4
Riffle gravel %	3		53			9
Substrate dominant %	3	38 GRAVEL				12
Substrate subdom. %	2	30 COBBLE				8
Canopy spp. (dom./codom.)	2			ALDER CONIFER		4
Conifer size class (cm)	3			< 50		6
Shade %	1	99				4
LWD: pieces/100m	3				6.5	3
LWD: vol./100m	2				3.9	2
Temperature (F)	1		59			3

Total: 72

STREAM HABITAT BENCH MARKS

(SMITH FOLLEY)
Stream name: TRIB. A, BIG TOM FOLLEY
Reach number: 2
Ranking: CATEGORY 2 (GOOD)

	scale	CAT. 1 (82-100) exc. 4	CAT. 2 (81-63) good 3	CAT. 3 (62-44) fair 2	CAT. 4 (43-31) poor 1	Total
% Pool area	2				2	2
Residual pool depth (m)	4					
small (order 1-3)					0.15	4
large (order 4+)						
Riffle W/D (wetted)	3				N/A	3
Riffle S/S/O %	2				16	2
Riffle gravel %	3		44			9
Substrate dominant %	3	44 GRAVEL				12
Substrate subdom. %	2	33 COBBLE				8
Canopy spp. (dom./codom.)	2		CONIFER ALDER			6
Conifer size class (cm)	3			<50		6
Shade %	1	100				4
LWD: pieces/100m	3			12.7		6
LWD: vol./100m	2				9.5	2
Temperature (F)	1		N/A			3

Total: 67

Tom Folley Landscape Analysis Meeting
Tyee RA
May 26, 1994

Attendance: Cleary, Cressy, Foster, Haske, Kottke, Olson, Passow, Weber, Witt

Group reviewed assignments (data collection & compilation) from last meeting. We then related data to proposed FY 94 management activities 94 and issues previously identified.

SUMMARY OF ISSUES AND RELEVANT DATA

1. **Access** - much of the area has unsuitable access for management activities due to unsurfaced roads.
   a. Proposed 3 Creeks Density Management Project has unsurfaced road access and steep grades.
   b. Lots of unsurfaced roads in the LAU that are controlled by private; BLM can't unilaterally surface and recover costs.

2. **T&E Species and/or Species of Concern** - need to review FSEIS Appendix B-11 (now ROD Table C-3) for required clearances.
   a. Tom Folley LAU contains both proposed Marbled Murrelet Critical habitat (in LSR's) and designated Marbled Murrelet Reserves.
   b. LAU contains Northern Spotted Owl Critical habitat and Core Areas to be protected.
   c. Need to identify "Survey and Manage, Known Sites" from ROD Table C-3. Haske will check on status of REO database.

3. **Cultural Resources** - need to identify known concerns. Most critical areas expected to be in wider floodplains.
   Isaac Barner, District archeologist, reports this area has low probability for cultural resources.

4. **T&E Fish** - related to water quality (sedimentation) and potential fish passage problems (man made or natural).
   a. Coho salmon, cutthroat trout, and steelhead all occur within this LAU. Petitions have been filed with USFWS for these species for listing as T&E species.
   b. Little Tom Folley has no data on fish usage. Tom Folley Creek was surveyed for fish use in 1975 and stream habitat in 1991. These surveys indicate significant fish usage in the basin. In general, 2nd order and larger streams being utilized.
   c. ODFW stream habitat survey indicates a lack of Large Woody Debris, pools, and spawning gravels.
   d. DEQ 1988 statewide assessment for water pollution indicates "moderate" problems on Big Tom Folley Creek as related to water quality affecting fish (nutrients), stream quality affecting aquatic habitat (structure), and water quality related to nonpoint source pollution (sediment).

T&E Fish (continued)

e. Existing survey data does not identify fish passage problems. Future data can be collected on culverts and drainage needs.
f. county water master does not have any monitoring (flow) data.

5. Need to identify **species and age class distribution among riparian reserves**. Concern related to possible over abundance of hardwood as compared to conifer riparian areas.
    a. *ODFW Stream Habitat Survey Data has information that can* provide estimates of hardwood versus conifer in riparian areas. Data is available for N. Fork and Saddle Butte. Evan Olson will summarize for the WA file.
    b. Hardwood vs conifer dominated riparian areas on streams without ODFW data can be determined using a transect/intercept technique off of aerial photos. Chris Foster will complete for the WA file.
    c. GIS can quantify riparian areas "never entered" (100 years plus in age?)
    d. Goal of a., b., and c., above, is to identify Riparian Reserves that approximate a desired future condition (unentered, conifer dominated) versus those that need work (hardwood dominated).

6. **Road conditions** - surfacing types and known maintenance problems.
    Need engineering input on known maintenance problems.

7. **Existing road densities.**
    Need to identify existing road densities for the LAU at the "baby bear" level. GIS road theme; Passow to complete.

8. Water quality as related to potential for mass wasting and sheet and rill erosion.
    a. Dan Cressy is mapping sedimentation problem areas related to unsurfaced roads and skid trails.
    b. Cressy has completed historical review of aerial photos. Review indicates a lot of healing of past sedimentation resulting from road construction (side casting and construction up the drainage). Current existing problems seem to be related to the combination of natural surface roads with steep grades.

The team then discussed data needs, analysis needs, and concerns regarding projects proposed in the Tom Folley LAU prior to the ROD.

Three Creeks Density Management

1. Need to assure that all big trees would be left. (What's big?)
2. Need to analyze the proposal versus stated LSR objectives.
3. Need informal REO OK for project. How do we get this? Haske/Weber/Witt to discuss format for proposal. Haske will investigate procedure for REO review.
4. Can the fire management plan called for in the LSR standards and guides be specific to the project area or must is cover the entire LSR?

Little Tom Regeneration Harvest

1. General area has been identified.
2. How does the LAU stand in regard to the 15% old growth retention standard? Passow to provide data.

Alder Conversion (Riparian Enhancement)

1. Estimate 50 acres for FY 95 Jobs-in-the-Woods.
2. Do we need an LSR Assessment and REO OK? Haske will look for the answer to this question.

Future Data Needs

1. Noxious Weed Inventory and Mapping. Noxious weeds should be considered in all project proposals.

2. Monitoring Plan: Need to determine what level and where? Possible monitoring items: fish, water quality (sedimentation)

Assignments:

General Agreement that assignments would be completed by June 17 and data submitted to either Chris or Gary for compilation in LAU notebook. **Chris** will prepare write-up documenting issue tracking and project identification.

Haske	Check on status of REO database for Table C-3 "Known Sites" Check on status of RHA's. In draft RMP, RHA's appear throughout the land base. In the ROD, 100 acre core areas do not exist in Riparian Reserves. Is this a conflict? What is procedure for completing REO review of projects? Re: Three Creeks Density Management Coordinate formatting of Three Creeks proposal for REO review. With Witt and Weber. Do we need an LSR Assessment and REO OK for proposed FY 95 Riparian Enhancement (Alder Conversion)?
Olson	Summarize ODFW stream habitat data for N. Fork and Saddle Butte as related to conifer vs. hardwood dominated riparian areas.
Foster	Determine hardwood vs conifer dominated riparian areas on streams without ODFW data using a transect/intercept technique off of aerial photos. Complete for the Tom folley WA file.
Passow	Identify existing road densities for the LAU at the "baby bear" level. GIS road theme. How does the LAU stand in regard to the 15% old growth retention standard? Re: Little Tom Regen Harvest Proposal
Engineers	Need engineering input on known maintenance problems in Tom Folley LAU.

Gary

NOTES FROM FIRST LANDSCAPE ANALYSIS MEETING
TOM FOLLEY LAU
March 25, 1994

Tom Folley LAU was made a high priority for analysis based on OSO guidance. District was directed to emphasize FY 94 efforts on LAUs with:

- areas with planned salmonid restoration activities;
- areas with "other" types of restoration activities planned;
- areas where timber sales, silvicultural demonstration projects, and other activities could occur without precluding further options.

Potential projects planned in the Tom Folley LAU for 1994 include:

1. Three Creeks Density Management Project (22S-7W-1);

2. Riparian Restoration Activities (21S-7W-35).

Need to review existing guidance (Information Bulletins OR-94-081 and 94-106) to cross reference our final product against OSO guidelines.

Identified Project Specific Issues/Objectives:

<u>Three Creeks Density Management</u>:

1. Attainment of Old Growth Characteristics (PNW-447)
2. Prevent unacceptable loss of soil productivity due to compaction.
3. Prevent loss of Old Growth dependant species.
4. Maintain existing water quality.

<u>Riparian Restoration Projects</u>:

1. Need to cross reference FSEIS Objectives for Marbled Murrelet Reserves. Section 35 is identified as a MMR.

2. Accelerate increase of conifer component in Riparian Reserves for long term input of coarse woody debris.

<u>"Other" Issues Identified by the ID Team</u>:

1. Access - much of the area has unsuitable access for management activities due to unsurfaced roads.

2. T&E Species and/or Species of Concern - need to review FSEIS Appendix B-11 for required clearances.

3. Cultural Resources - need to identify known concerns. Most critical areas expected to be in wider floodplains.

4. T&E Fish - related to water quality (sedimentation) and potential fish passage problems (man made or natural).

5. Need to identify species and age class distribution among riparian reserves. Concern related to possible over abundance of hardwood as compared to conifer riparian areas.

6. Road conditions - surfacing types and known maintenance problems.

7. Existing road densities.

8. Water quality as related to potential for mass wasting and sheet and rill erosion.

To: ID Team Members, Tom Folley Landscape Analysis Team
From: Haske
Subject: Land Use Allocations and Objectives
Tom Folley Landscape Analysis Unit

The following land management objectives were taken from the Final Supplemental Environmental Impact Statement (FSEIS) on Management of Habitat for Late-Successional and Old-Growth Related Species Within the Range of the Northern Spotted Owl (February 1994). Numbers in parenthesis indicate the FSEIS citation.

The Tom Folley Landscape Analysis Unit (LAU) contains the following Land Use Allocation: Late Successional Reserves (LSR), Riparian Reserves, Marbled Murrelet Reserves, and Matrix lands consisting of Connectivity Blocks and General Forest Management Area (GFMA).

I attempted to reference the most critical objectives and restrictions on operations within these land use allocations. This listing is not complete, as I did not wish to recopy the entire FSEIS. This listing should provide for a good general overview.

Late Successional Reserves:

(2-23) LSR's are managed to protect and enhance conditions of the late successional and old growth forest ecosystems.

(2-60) Silvicultural treatments (including prescribed burning) are designed to ensure that treatments are beneficial to creation of late successional forest conditions (snags, coarse woody debris, large trees, canopy gaps, layered canopy, etc.).

(B-129) Non-silvicultural activities to be neutral or beneficial to creation or maintenance of late successional habitat.

(B-73 to B-80) Standards & Guidelines for silvicultural activities.

(B-129 to B-132) Standards & Guidelines for non-silvicultural activities.

Marbled Murrelet Reserves:

(2-28) Timber harvest is prohibited within occupied marbled murrelet habitat at least until completion of recovery plan.

(2-28) All contiguous existing and recruitment habitat (stands capable of becoming habitat within 25 years) within 0.5 mile radius of occupation site will be protected.

Riparian Reserves:

(2-28) Specified interim widths designed specifically to maintain and restore the structure and function of the reserve and to benefit fish habitat.

(2-29) Interim widths provided, based on five different categories of water bodies: (1) fish bearing streams; (2) permanently flowing non-fish bearing streams; (3) seasonally flowing or intermittent streams; (4) constructed ponds, reservoirs, and wetlands > 1 acre; (5) lakes and natural ponds. Actual widths stated on 2-29 and 2-62.

(2-30) Interim widths could be adjusted if results of watershed analysis demonstrate that an adjustment is appropriate.

(B-82) Management activities are tied to the ability to "meet" or "not prevent attainment of" Aquatic Conservation Strategy (Appendix B-6).

(B-84) Riparian dependant resources receive primary emphasis.

Connectivity:

(B-8) Provide for movement, dispersal, and connectivity of plant and animal species, and maintain ecotypic richness of diversity in the forest matrix.

(2-63) Manage on 150 year rotations.

(2-63) Maintain 25-30% of each block in late successional condition at any point in time.

(2-63) Retain 12-18 trees per acre in harvest units.

(2-63) Retain specified amounts of down (coarse) woody debris.

(2-64) Retain 100 acres of the best spotted owl habitat as close to nest sites or activity centers known as of 1/1/94.

GFMA:

(B-11) Use intensive forest management practices to maintain a high level of sustainable timber production while maintaining long term site productivity, biological legacies, and a biologically diverse matrix.

(B-11) Retain a minimum of 6-8 green conifers per acre, along with snags, coarse woody debris, and hardwoods.

(2-64) Retain 100 acres of the best spotted owl habitat as close to nest sites or activity centers known as of 1/1/94.

General:

(B-148) Retain late successional patches in fifth field watersheds (20-200 square miles) which are currently comprised of 15% or less late-successional forest.

February 3, 1994

Example Outline for Landscape Analysis Documentation

The following is an outline for the first part of the landscape analysis. Remember the links to and interactions with surrounding landscapes if necessary in any category. What is actually included in a landscape analysis is based on the complexity of the Landscape Analysis Unit. All of the items in this outline may not be needed in some analyses, but there may be other items needed that are not included in this list. For some of the items in this outline, a sentence or paragraph may suffice, while others will require a lengthier discussion.

Be sure to check the Guide for Pilot Watershed Analysis for further guidance on any of these topics. We need to become familiar with that process and its contents and begin to utilize it with our landscape analysis.

Description of existing environment

I. General Information for the Landscape Analysis Unit (LAU) - describe the significant geographic, human, and resource features

- A. General location, basin, analytical watershed, compartments
- B. Size (acres)
- C. Climate, precipitation levels, seasonal patterns
- D. Landforms
    - 1. Elevations
    - 2. Geomorphology
    - 3. Topography
- E. Physiographic province and major vegetation group (Franklin & Dyrness, 1973)
- F. Land use classification
- G. Special areas (i.e. ACEC, RNA, ONA)
- H. Ownership status, BLM/Private
- I. Patterns, rural interface, county zoning

II. Resource Specific Information for the LAU

- A. Soils, geology, landforms
    - 1. General characterization of soils - soil survey information (all lands)
        - a. Soil depth
        - b. Surface texture
        - c. Subsurface texture
        - d. Available water holding capacity
        - e. Site class
    - 2. Geology
    - 3. Landforms
        - a. Watershed (steep slopes and valleys, rolling hills and broad valleys)
        - b. Streams (valley constrained, alluvial terrace, floodplain)
    - 4. Unstable and fragile areas
        - a. TPCC classifications and withdrawals
        - b. Headwalls, slumps, landslides
- B. Hydrology
    - 1. Stream locations and orders
        - a. Fish bearing, non-fish bearing perennial, intermittent streams

2. Water quality concerns (1988 DEQ Assessment of Non-point source pollution, etc.)
3. Riparian
    a. Location of and acres in riparian reserves by age class and type
    b. Existing stream buffers - width and age class
4. Clean Water Act requirements (designated beneficial uses, water quality criteria, aquatic health) See Jan. 13 guidance.
    a. Domestic water use
    b. Municipal watersheds
5. Ponds and pump chances - location, size, quantity, rights
6. Transient snow zone
7. Watershed condition
    a. Equivalent clearcut area
    b. Compacted area
8. Watershed history and impacts to stream and riparian area
    a. Effects of previous natural disturbances (landslides, headwalls)
    b. Effects of land use activities on processes (roads, harvests)

C. Fisheries

1. Anadromous and resident fish presence
    a. If no inventory exists, then potential species occurrence
2. Special status species, at risk fish stocks and species
3. Habitat condition inventory (ODFW)

D. Vegetation

1. Existing vegetation
    a. Age class distribution (use wildlife age classes) and cover type (Ol, POI)
    b. Percent thinned vs. unthinned, shelterwoods, overstory removal by age classes
2. Plant species of concern (Special status sp., FEMAT species at risk, noxious weeds)
    a. Known locations
    b. Potential species and potential habitat locations
    c. Areas surveyed
3. Special habitat features
4. Special forest products (high permit areas, areas of availability)
5. Plant associations
6. Plant and tree disease and insect infestation areas

E. Wildlife

1. Fragmentation
    a. Edge, patch size, insular habitat
2. Owl sites - Reserve Pair Areas, Habitat 1, 2, and 3 lands
3. Marbled murrelets
4. Other special status species locations and potential species and habitats
5. Known nest locations for raptors
6. Elk management areas
    a. Forage/cover ratio (Wisdom model)
    b. Road densities
7. Special habitat features
8. Linkages with other watersheds

F. Road information

1. Miles of road and surface type (BLM and private)

2. Miles of unnumbered roads jeep trails, cat trails on BLM
3. Miles of private roads, surface type, not in the system
4. Access information
    a. Status of roads and structures needed for BLM access
    b. Roads with exclusive or non-exclusive access
    c. BLM Roads that provide access to private homes, comm. sites, mines, lookouts
5. Roads with BLM maintenance and maintenance level
6. Areas with historic maintenance problems
7. Utility right of way locations
8. Rock quarry locations - quantity and quality, rights

G. Fire and fuels management
1. Fire history - patterns and intervals
2. Designated areas for smoke management

H. Cultural resources
1. Known cultural sites and areas of cultural concern

I. Recreation
1. Existing sites, trails, OHV use
2. Wild and scenic rivers
3. Back country by-ways
4. Other recreational uses

J. Visual Resources
1. VRM classification, visually sensitive areas

K. Mining
1. Active claims
2. Past activities that influenced the watershed

L. Grazing

M. Improvements and structures
1. Fences, check dams, guzzlers, etc.

N. Other Land Use Authorizations

Files

February 24, 1994

Tyee Area Manager

Tom Folly Landscape Analysis Team

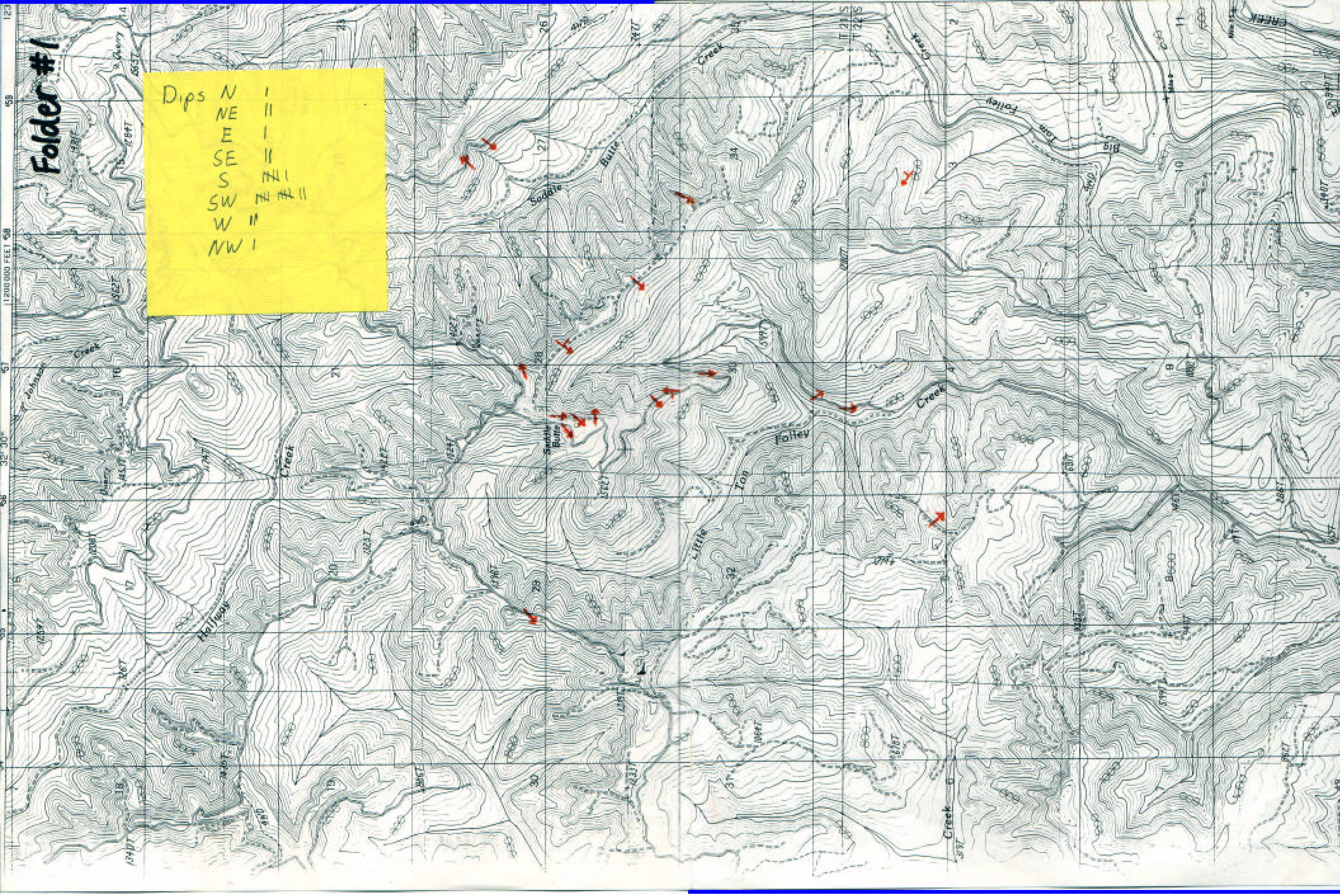
I am making the following assignments to the team responsible for completing the landscape analysis for the Tom Folly area:

Joe Witt - Team Leader
Rick Kottke
Gary Passow
Evan Olson
Dan Cressy
Pete Howe

The first order of business will be to schedule a meeting to discuss the purpose and methodology for the landscape analysis.

Mike Haske and Steve Weber will be available for advice or questions throughout the process. Other people will be made available as needed.

cc: Team Members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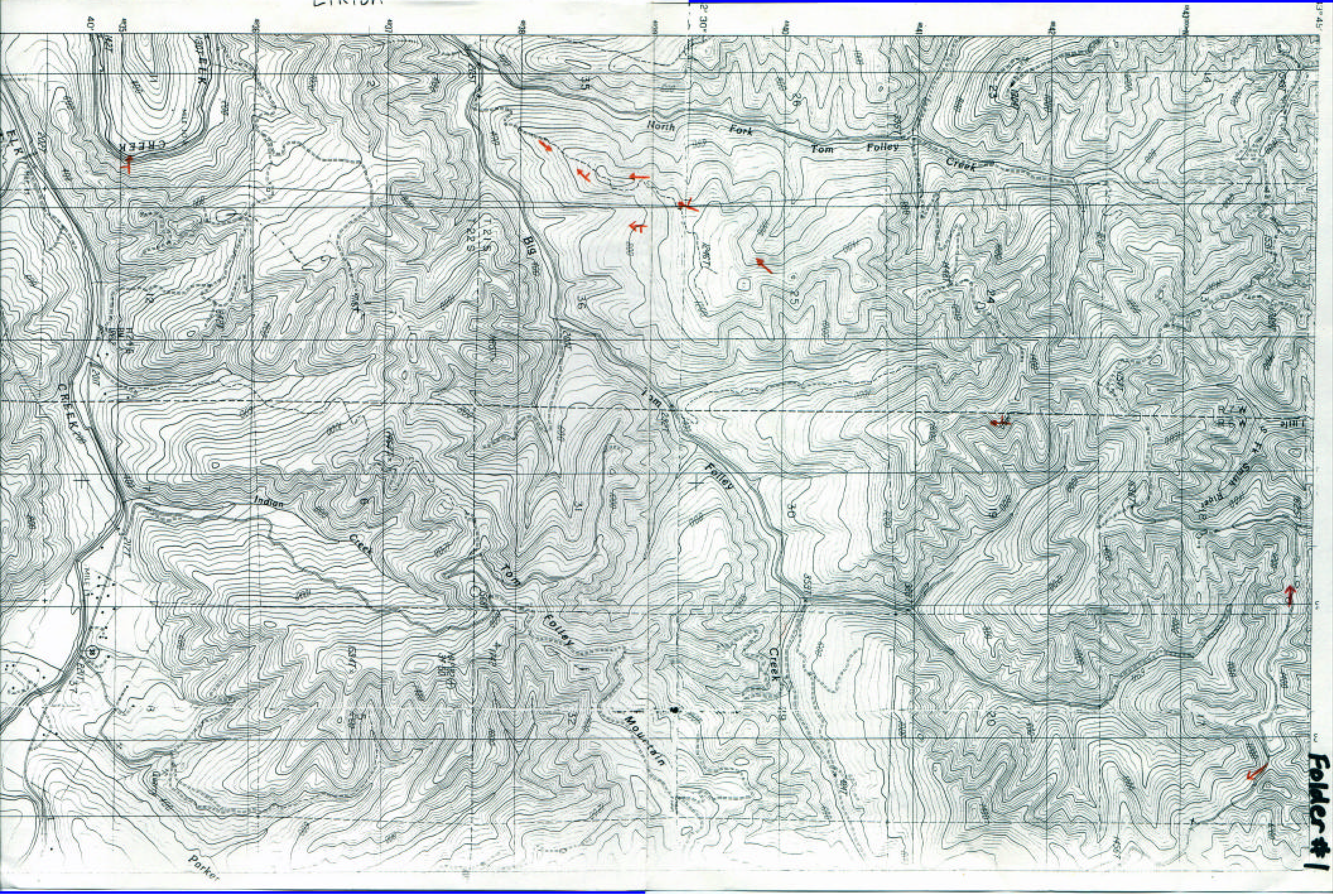
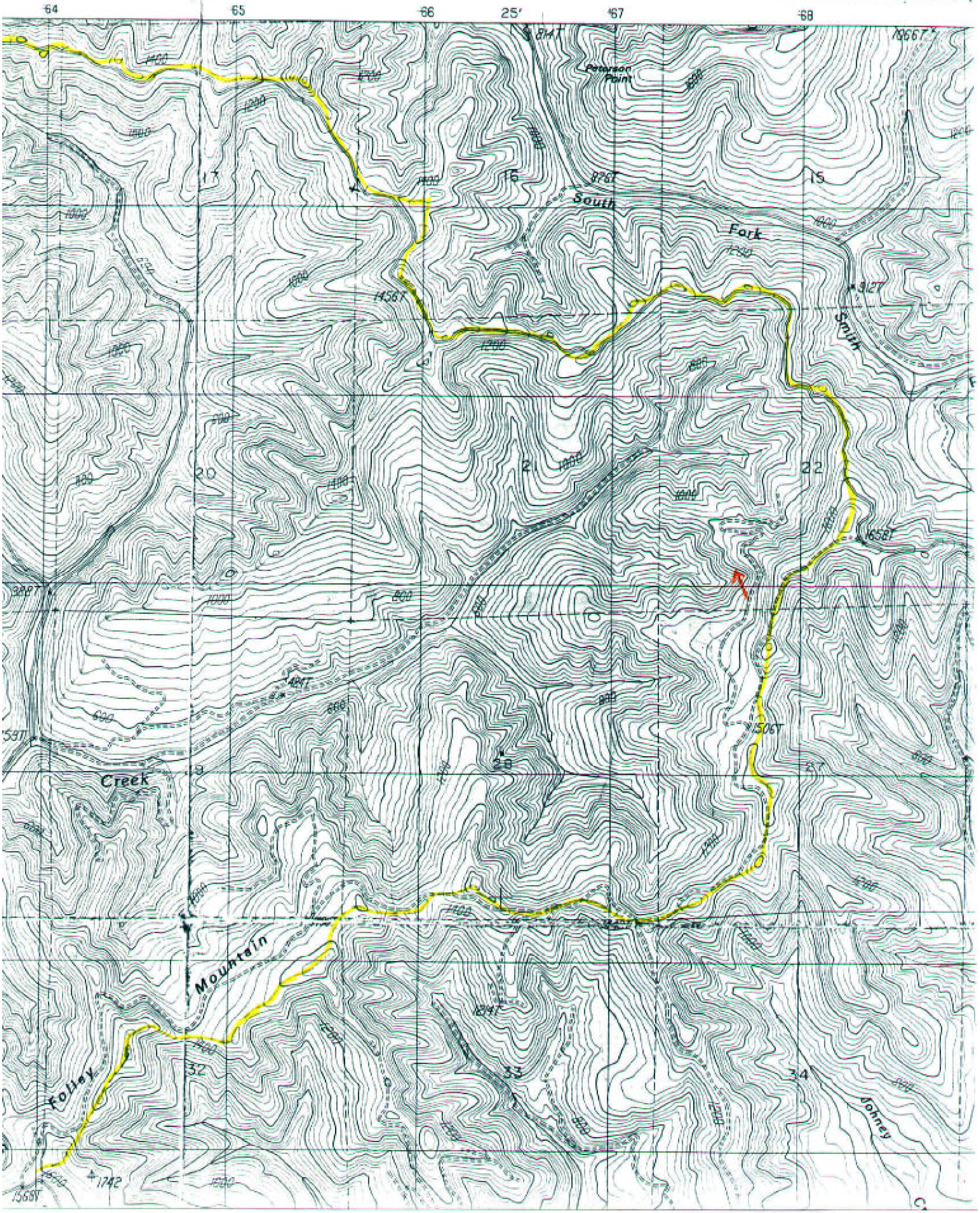
Saddle Butte
Creek
Folley Creek
Little
Creek
Johnson Creek
Big
Creek


North Fork Tom Folley Creek
Big Tom Folley Creek
Indian Creek
Tom Folley Mountain
Parker
Folder #1

Folder 1 Beaver Creek

OREGON—DOU
7.5 MINUTE SERIES (



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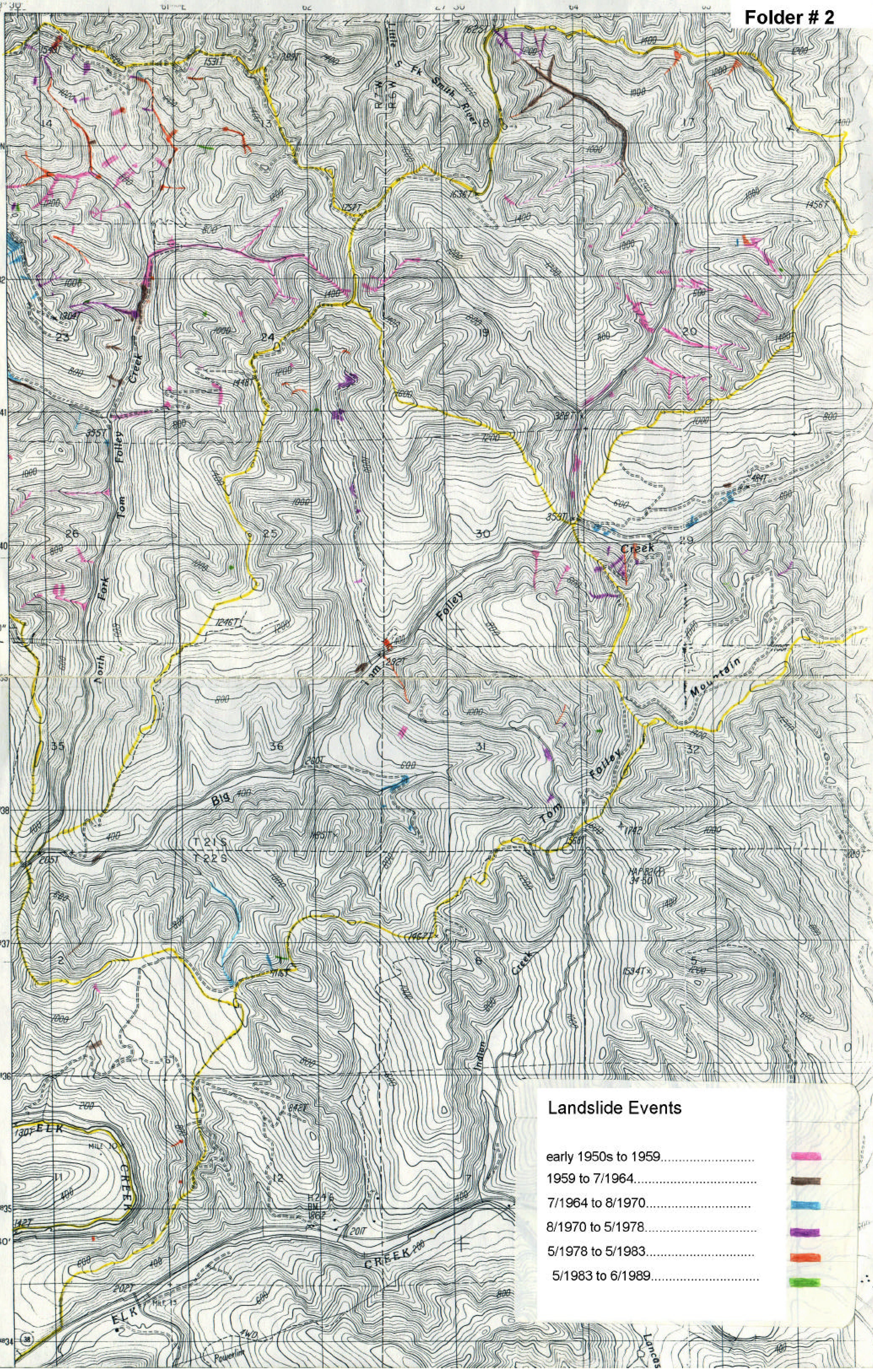
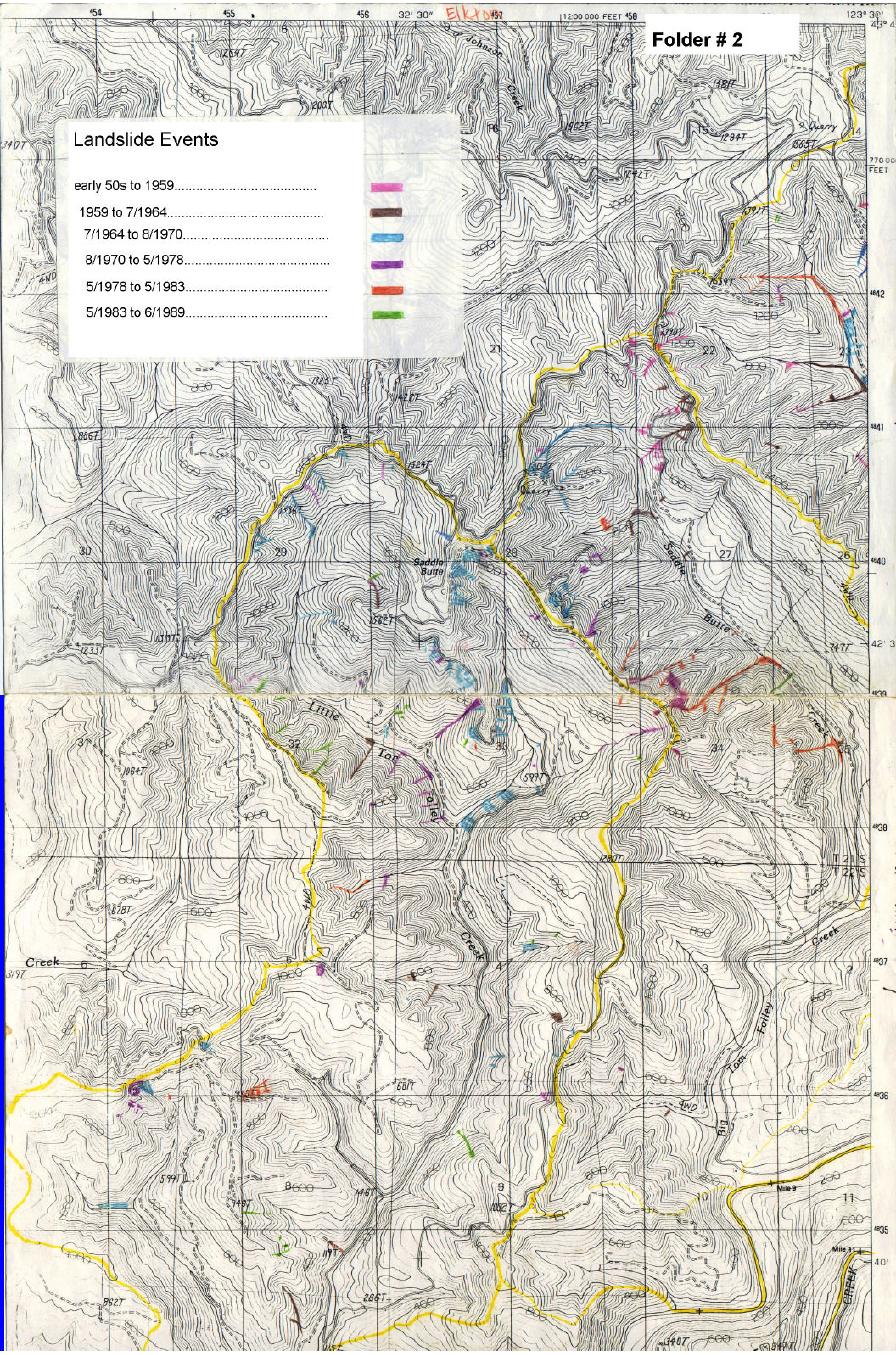


Little S Fk Smith River
North Fork Tom Folley Creek
Big Tom Folley
Tom Folley Creek
Creek
Mountain
Indian Creek
ELK CREEK
T 21 S
T 22 S
Landslide Events
early 1950s to 1959
1959 to 7/1964
7/1964 to 8/1970
8/1970 to 5/1978
5/1978 to 5/1983
5/1983 to 6/1989



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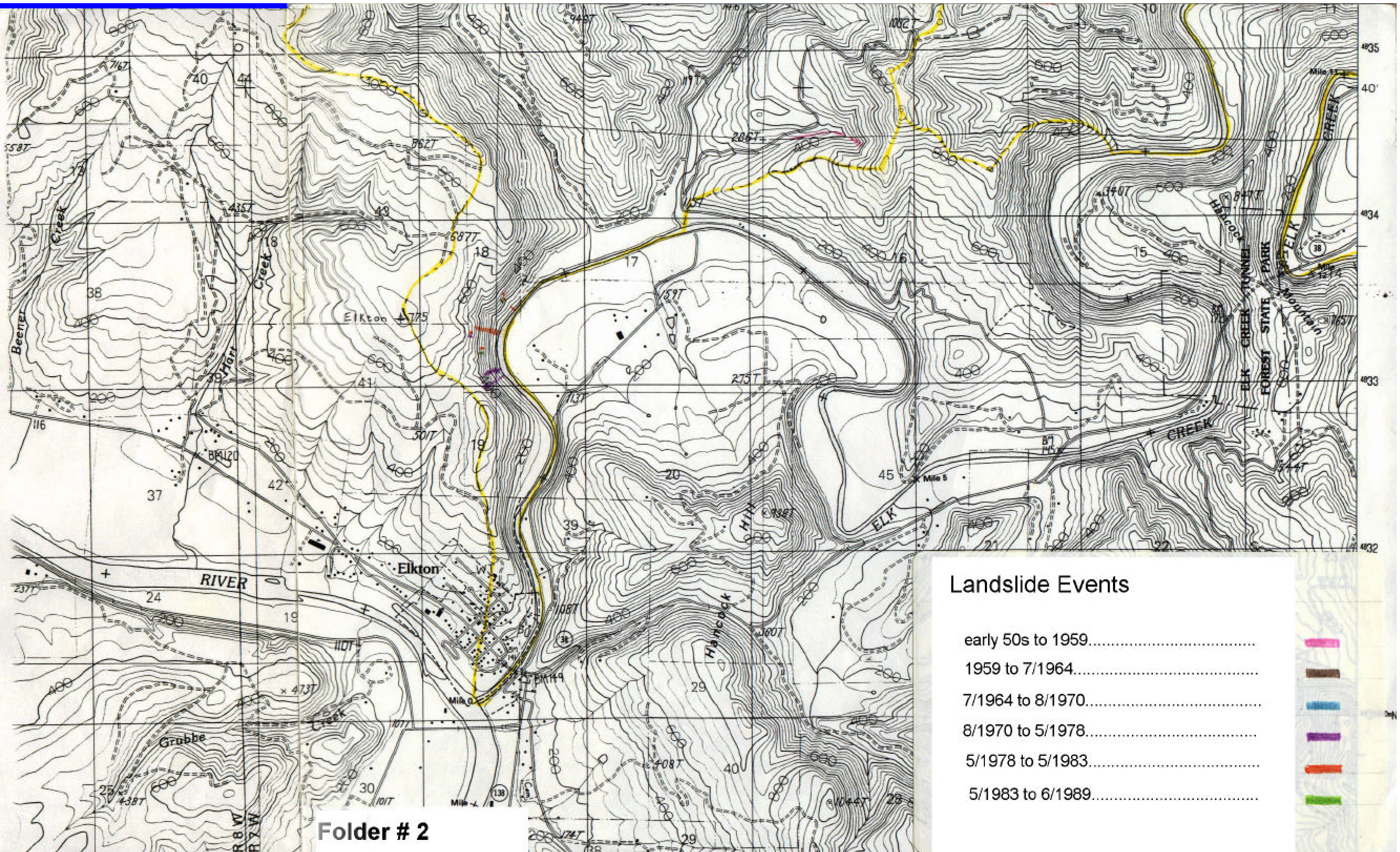
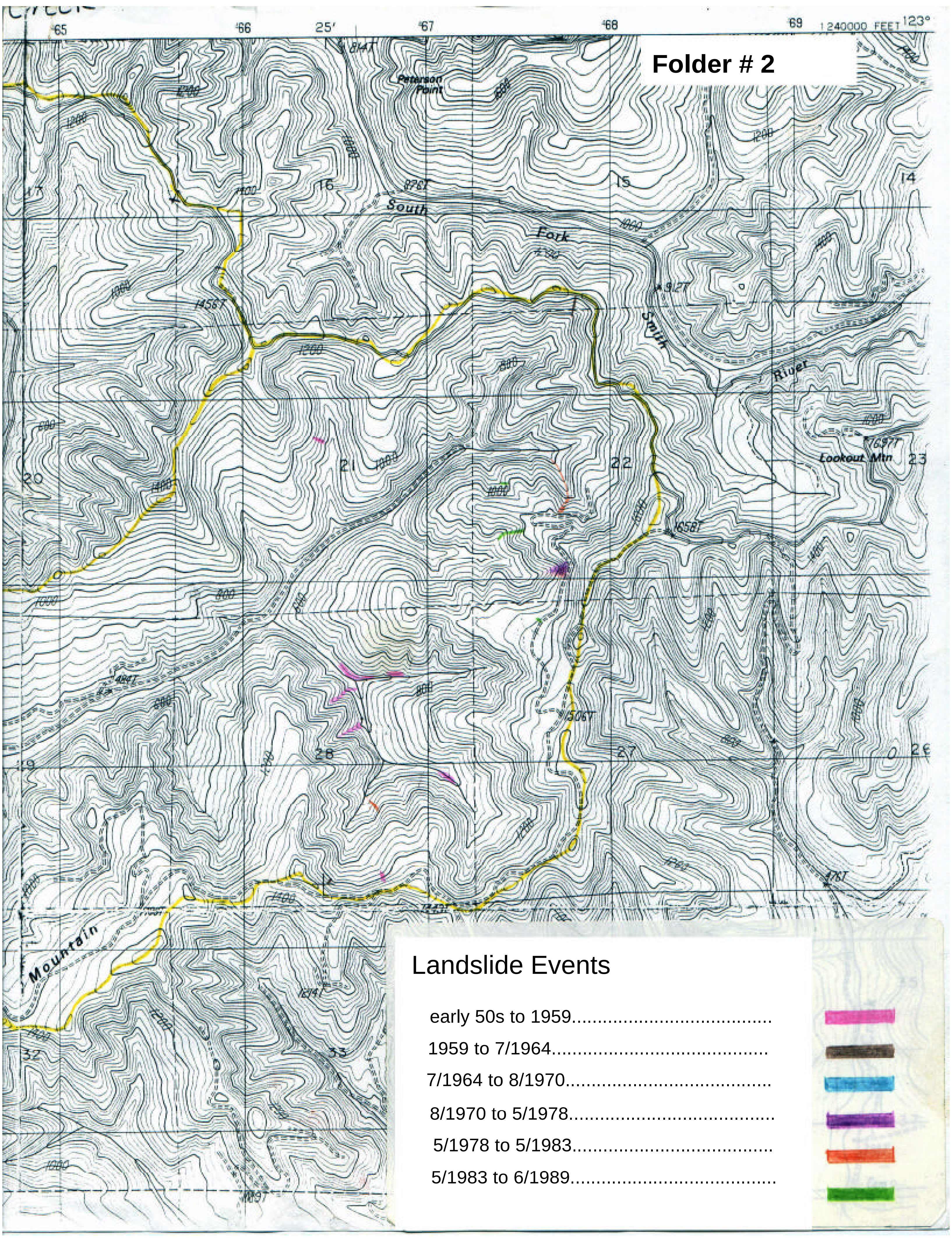
Landslide Events
early 50s to 1959
1959 to 7/1964
7/1964 to 8/1970
8/1970 to 5/1978
5/1978 to 5/1983
5/1983 to 6/1989
Elkton
Johnson Creek
Quarry
Saddle Butte
Little Tom Folley
Creek
Big Tom Folley
Creek
4WD
T 21 S
T 22 S
Mile 9
Mile 11
CREEK



Landslide Events
early 50s to 1959....................................
1959 to 7/1964..
7/1964 to 8/1970......................................
8/1970 to 5/1978....................................
5/1978 to 5/1983....................................
5/1983 to 6/1989....................................
Elkton
RIVER
ELK
CREEK
Hancock
Hart Creek
Grubbe Creek
Beener Creek
Hancock Mountain
Hancock Hill
ELK CREEK TUNNEL FOREST STATE PARK
Mile 5
Mile 0

Folder # 2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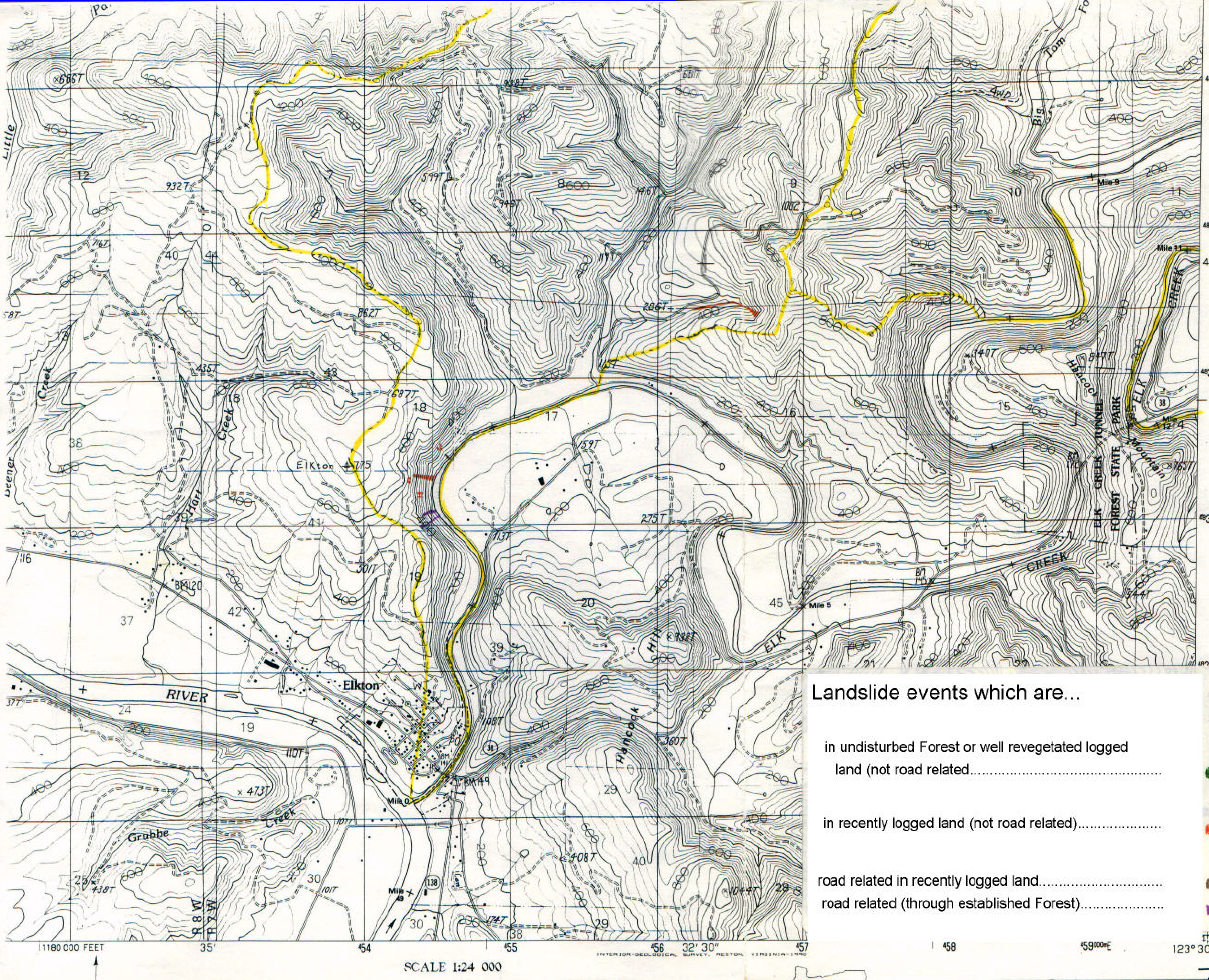
Peterson Point
South
Fork
Smith
River
Lookout Mtn
Mountain
Landslide Events
early 50s to 1959......................................
1959 to 7/1964...
7/1964 to 8/1970.......................................
8/1970 to 5/1978.......................................
5/1978 to 5/1983......................................
5/1983 to 6/1989.......................................

Folder # 3



Landslide events which are...

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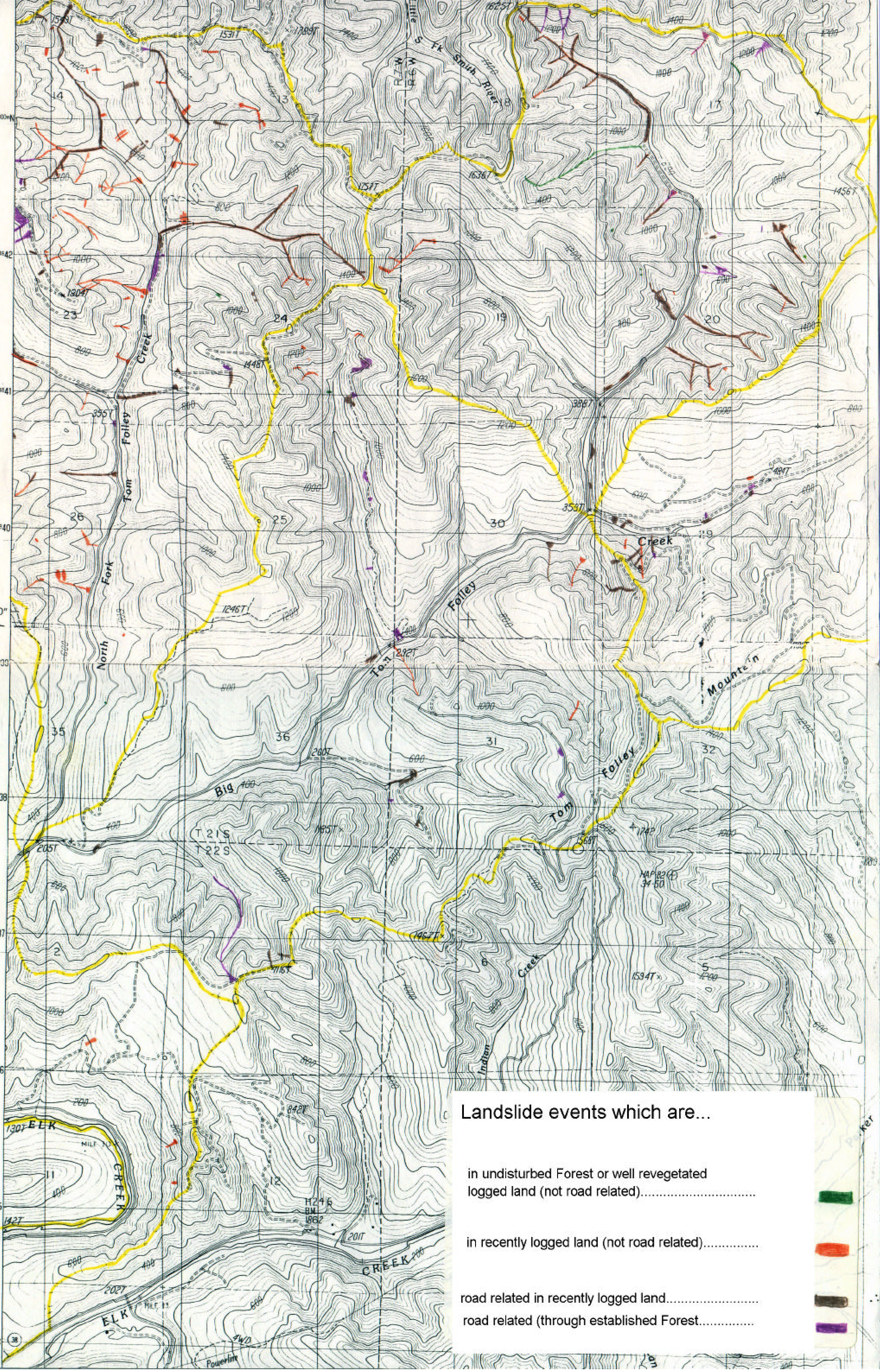
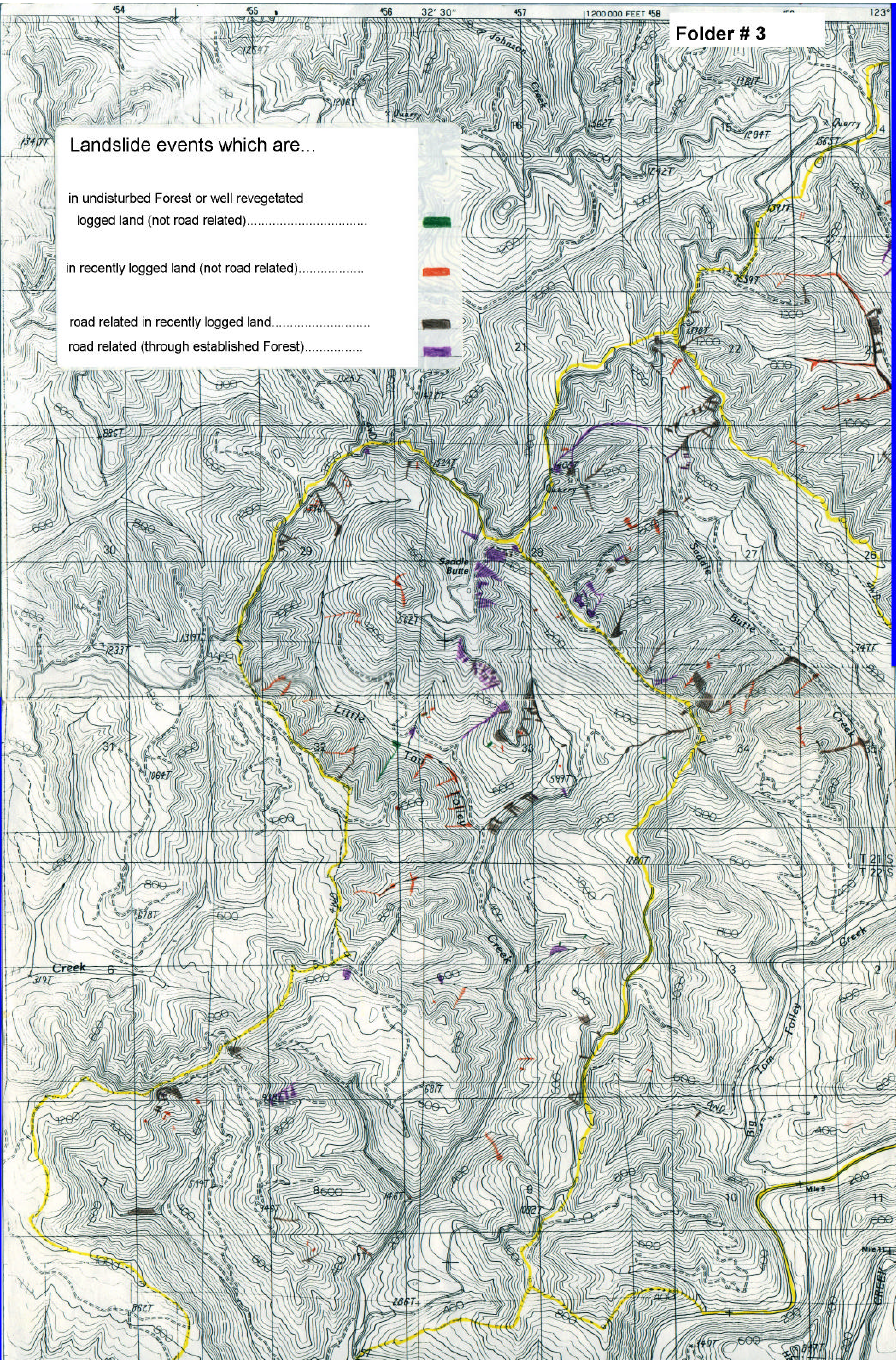
in recently logged land (not road related).....................

road related in recently logged land..............................

road related (through established Forest)....................


Landslide events which are...
in undisturbed Forest or well revegetated logged land (not road related)..............................
in recently logged land (not road related)..............
road related in recently logged land.........................
road related (through established Forest...............
North Fork Tom Folley Creek
Big Tom Folley Creek
Tom Folley Mountain
Indian Creek
Elk Creek
T 21 S
T 22 S



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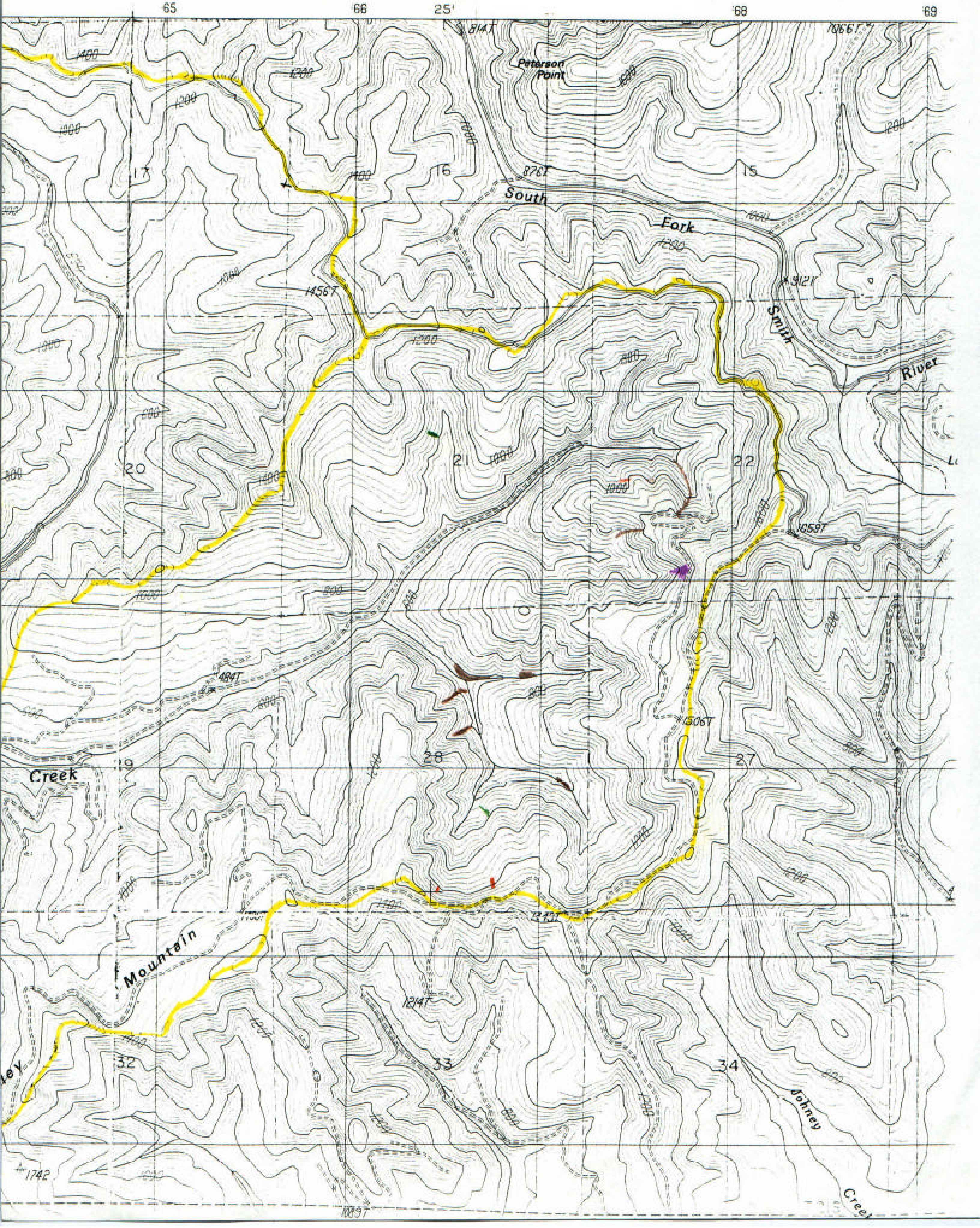
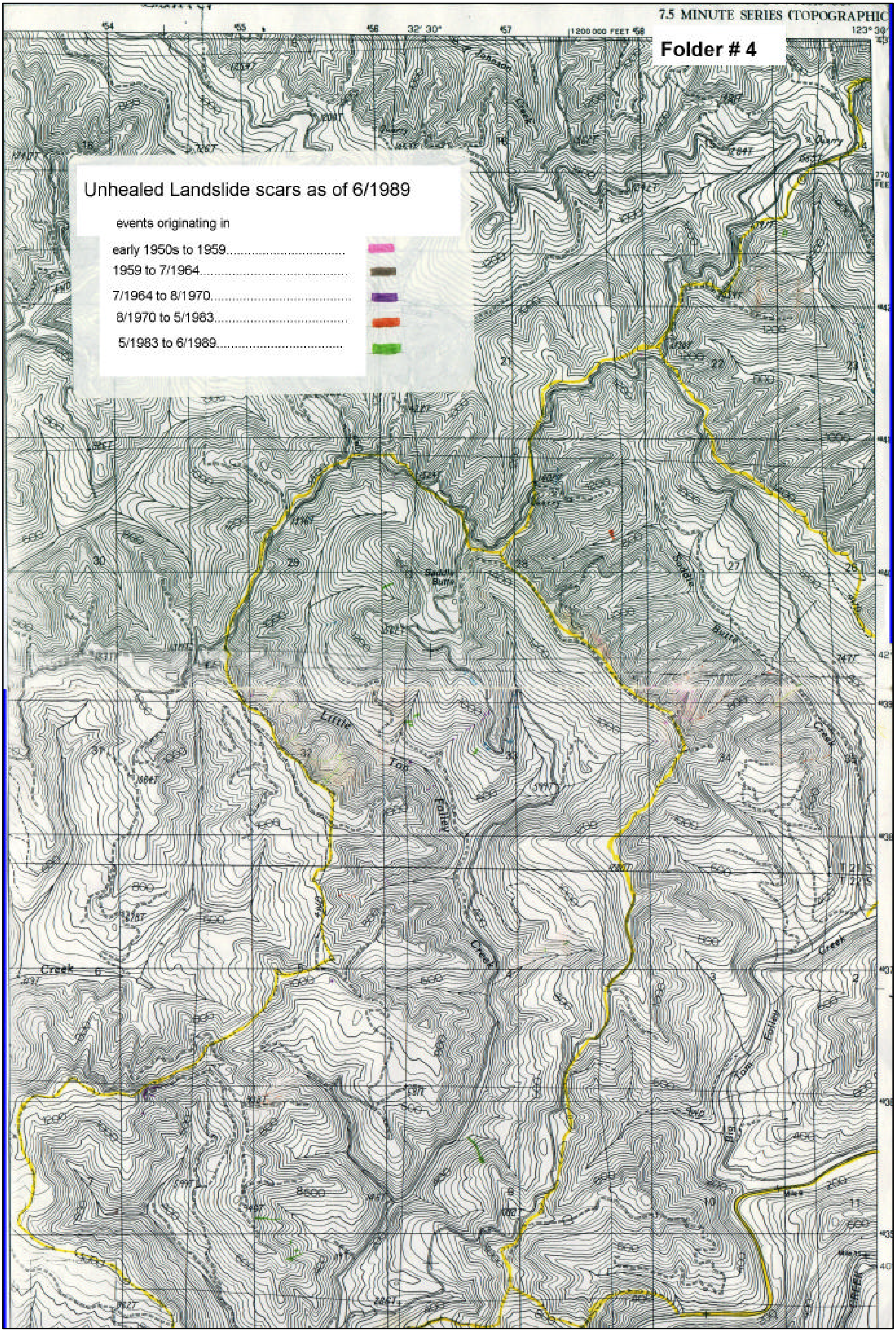
Landslide events which are...
in undisturbed Forest or well revegetated logged land (not road related)................................
in recently logged land (not road related).................
road related in recently logged land..........................
road related (through established Forest)...............
Saddle Butte
Little Tom Folley
Saddle Butte
Creek
Johnson Creek
Big Tom Folley Creek
Quarry
T 21 S
T 22 S

Beaver Creek **Folder # 3**

OREGON—DOUGLAS
7.5 MINUTE SERIES (TOPC





7.5 MINUTE SERIES (TOPOGRAPHIC
Folder # 4
Unhealed Landslide scars as of 6/1989
events originating in
early 1950s to 1959..................................
1959 to 7/1964...
7/1964 to 8/1970.......................................
8/1970 to 5/1983.....................................
5/1983 to 6/1989....................................
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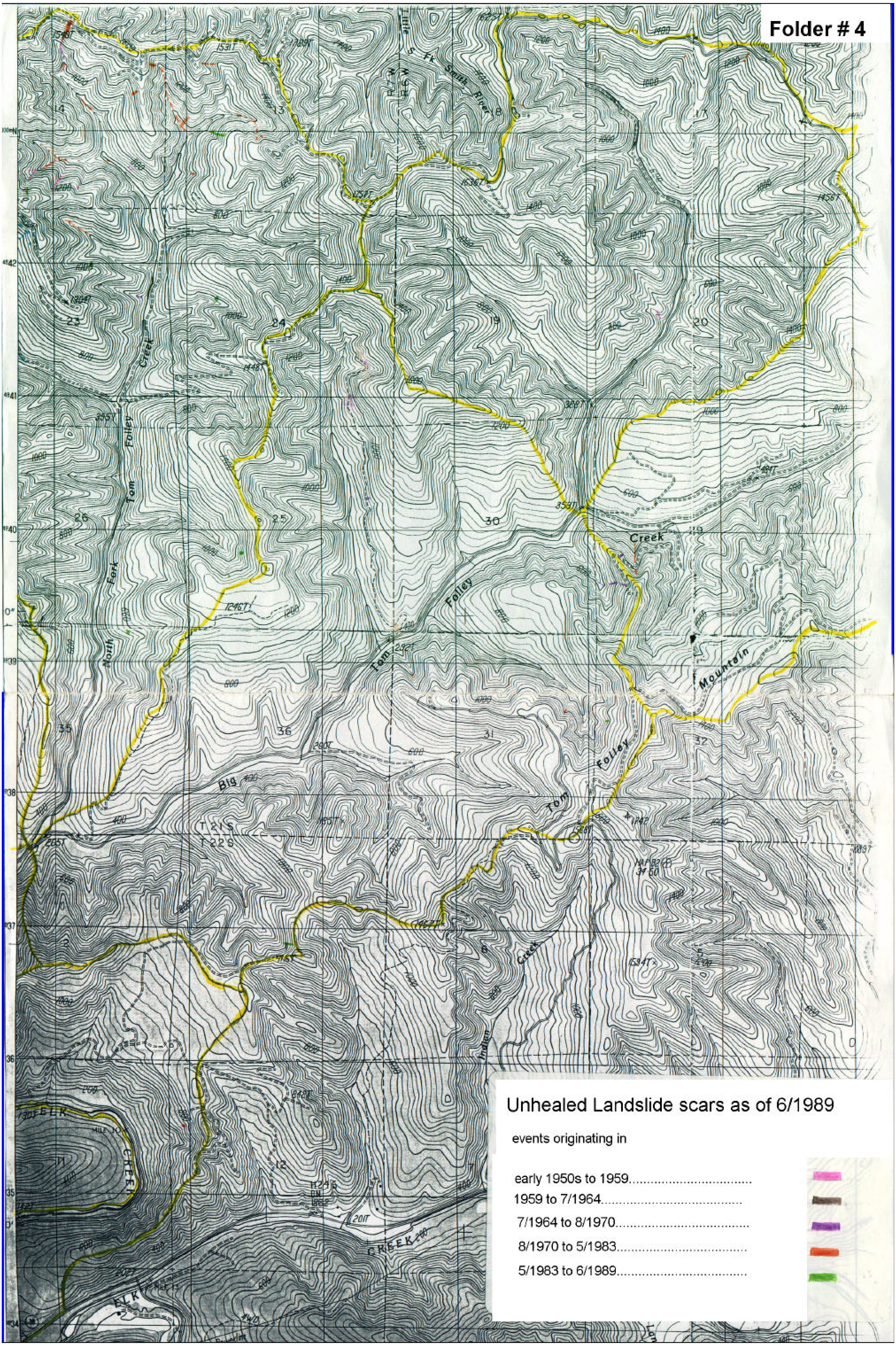
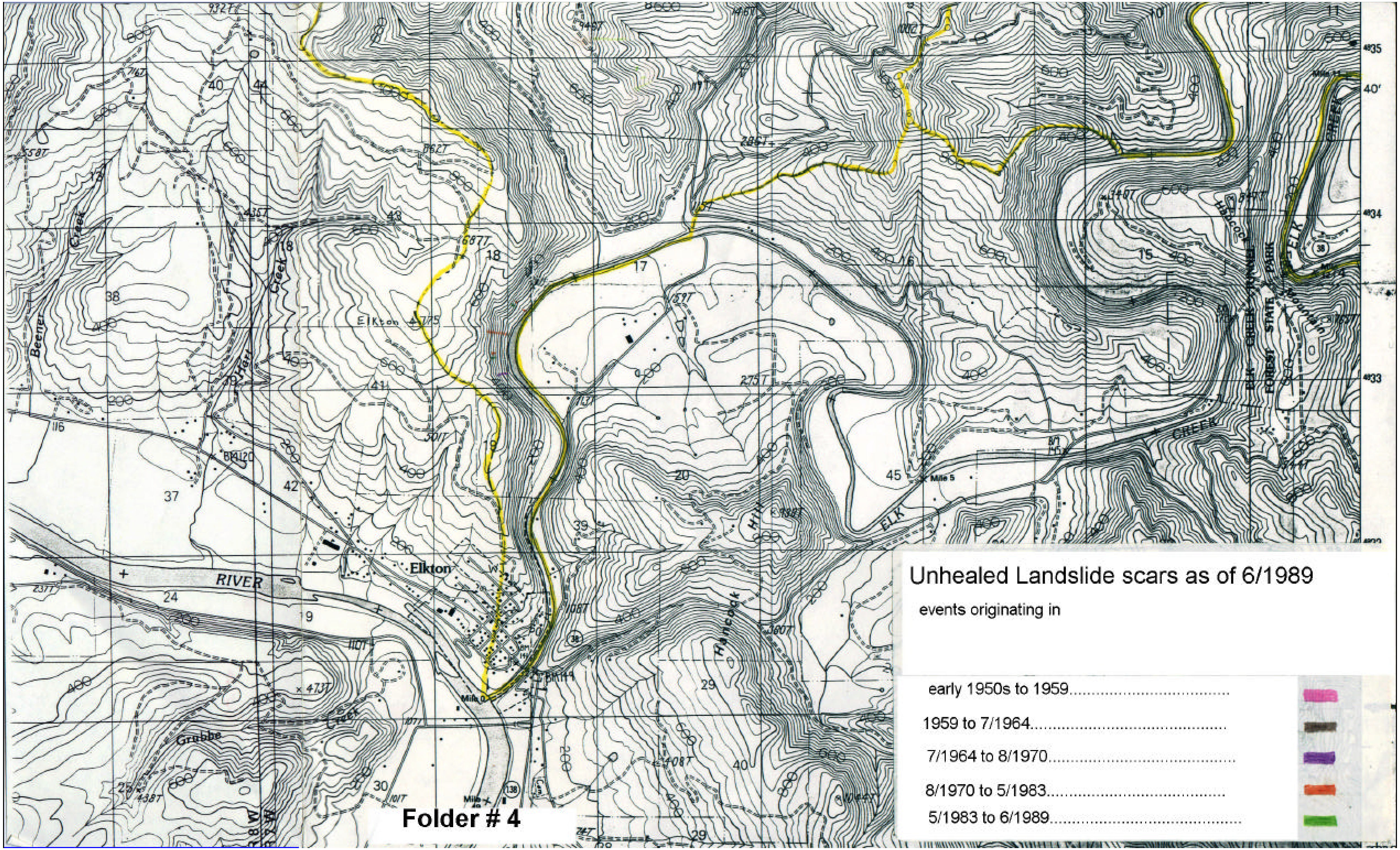
Little
Tom
Folley
Creek
Scaponia
Butte

Folder # 4


Unhealed Landslide scars as of 6/1989
events originating in
early 1950s to 1959..................................
1959 to 7/1964..
7/1964 to 8/1970....................................
8/1970 to 5/1983...................................
5/1983 to 6/1989...................................
Little S. Ft. Smith River
North Fork Tom Folley Creek
Tom Folley Creek
Big Tom Folley
Mountain Creek
Indian Creek
ELK CREEK
T21S
T22S


Unhealed Landslide scars as of 6/1989
events originating in
early 1950s to 1959
1959 to 7/1964
7/1964 to 8/1970
8/1970 to 5/1983
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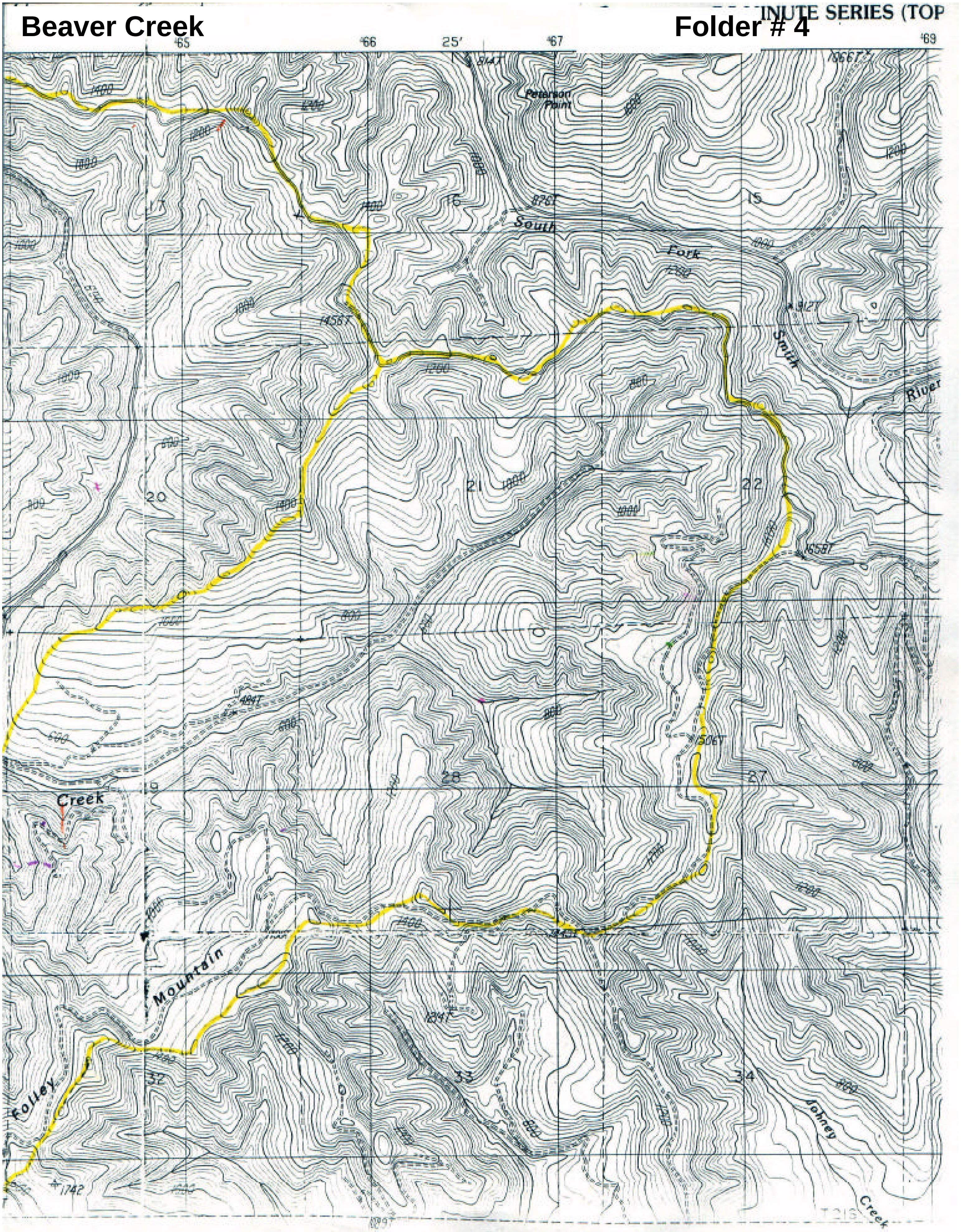
Elkton
RIVER
ELK CREEK
Hancock
Beener Creek
Grubbe
Folder # 4

Beaver Creek Folder # 4



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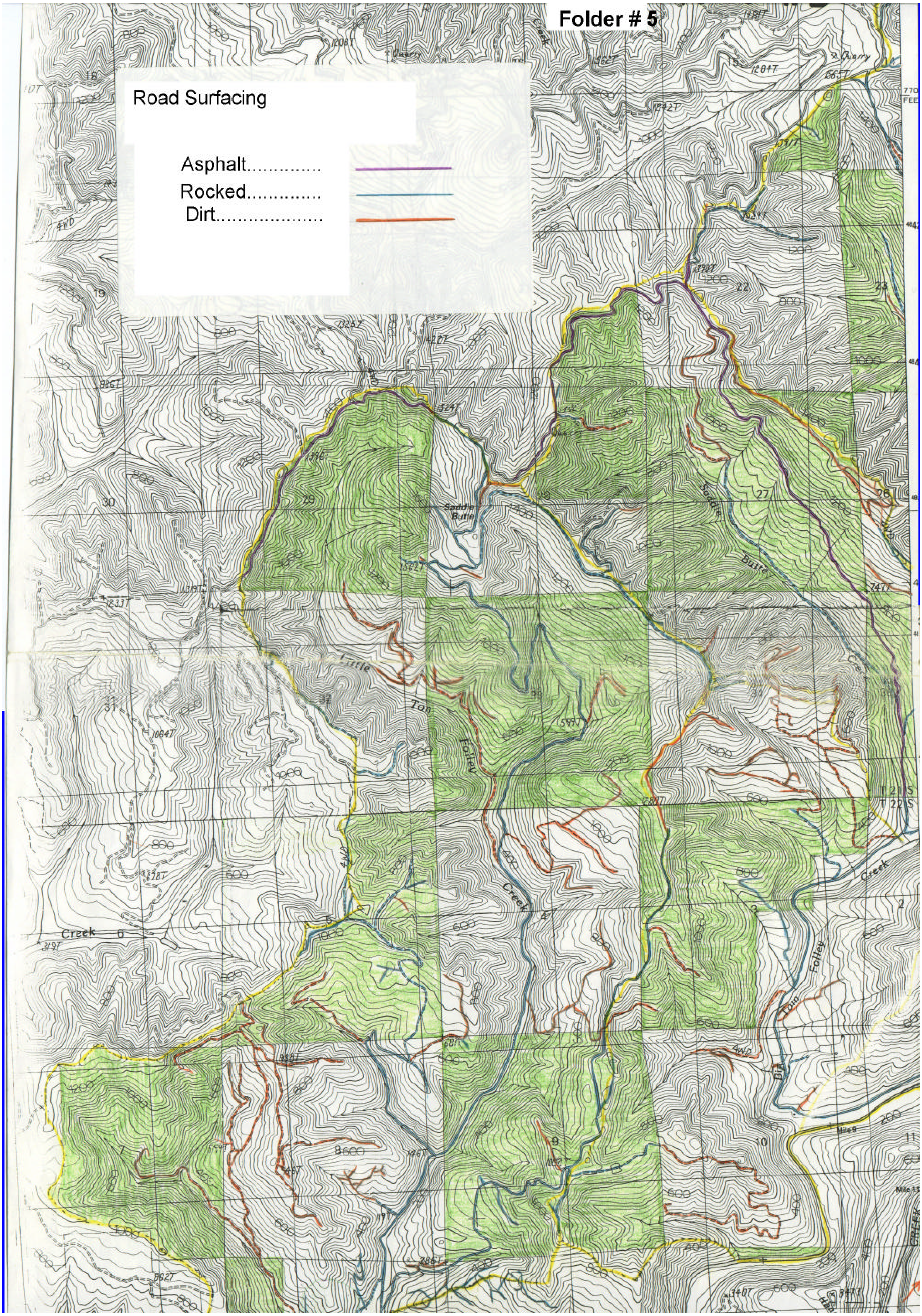
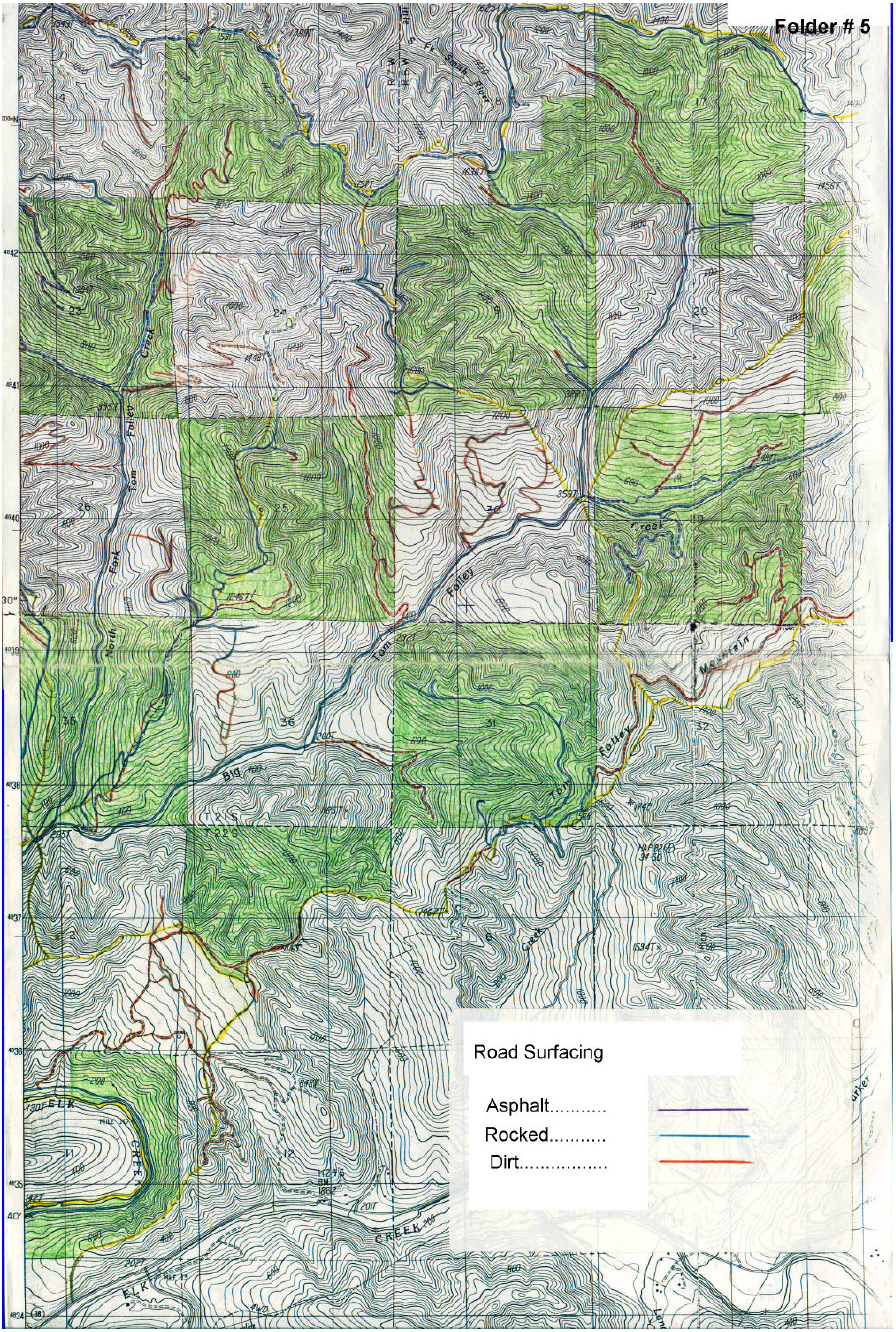
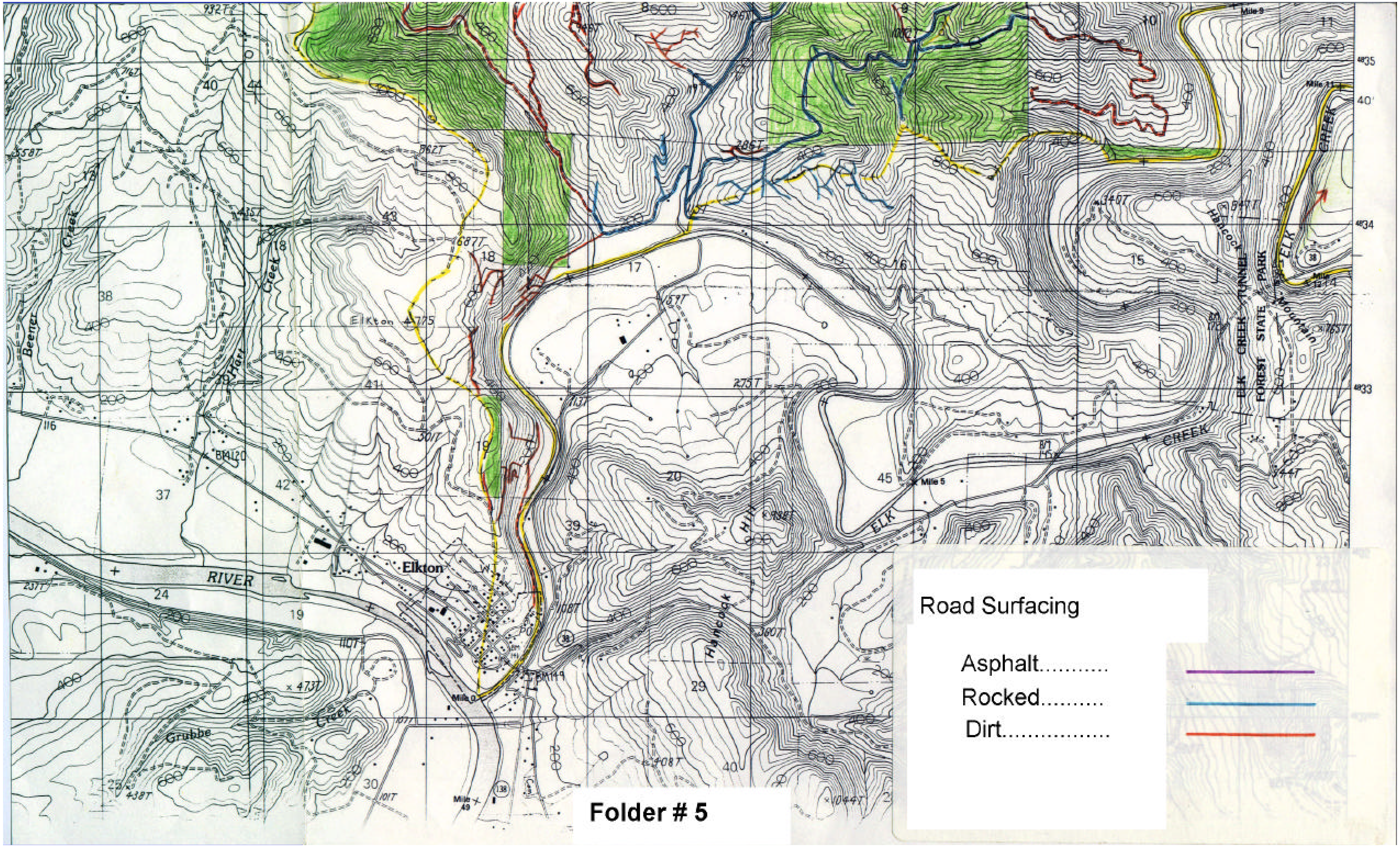


Road Surfacing
Asphalt.............
Rocked.............
Dirt....................
Saddle Butte
Little Tom Folley Creek
Saddle Butte Creek
Tom Folley Creek

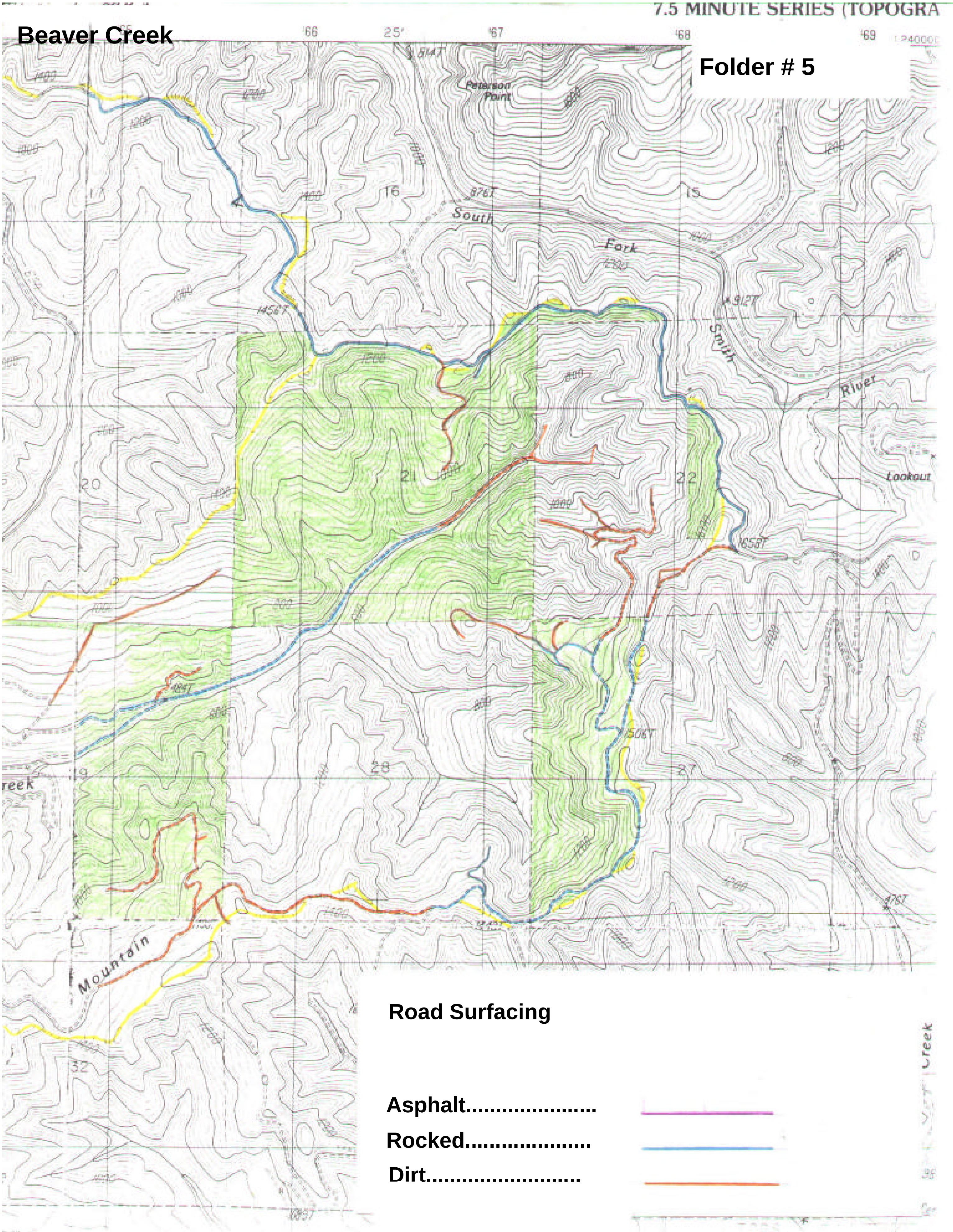
Folder # 5




Elkton
Elkton
RIVER
ELK
CREEK
ELK CREEK
Beener Creek
Grubbe
Creek
Hancock
Hill
Hancock Mountain
ELK CREEK TUNNEL FOREST STATE PARK
Mile 5
Mile 0
Road Surfacing
Asphalt...........
Rocked..........
Dirt.................
Folder # 5

Beaver Creek

Folder # 5

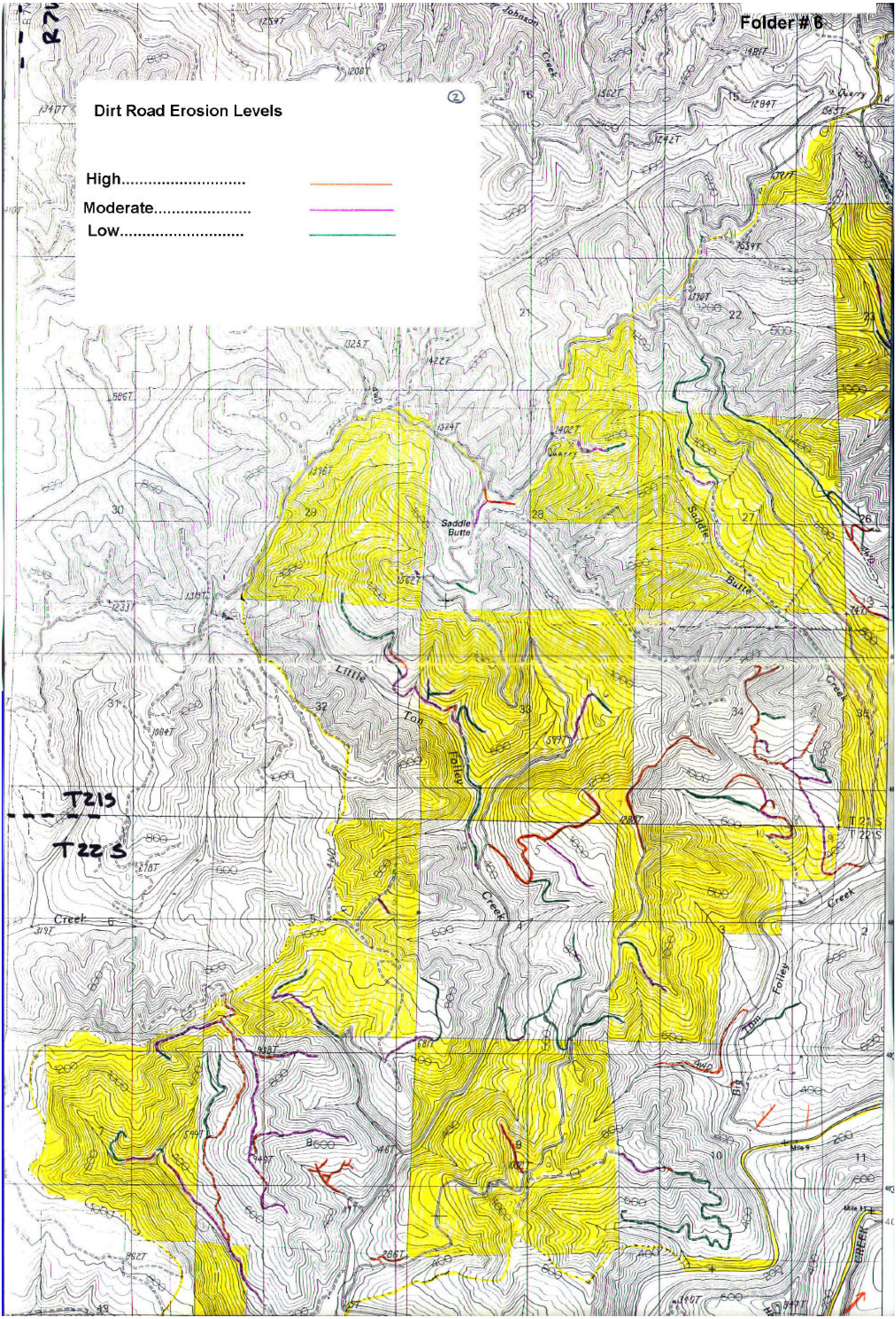


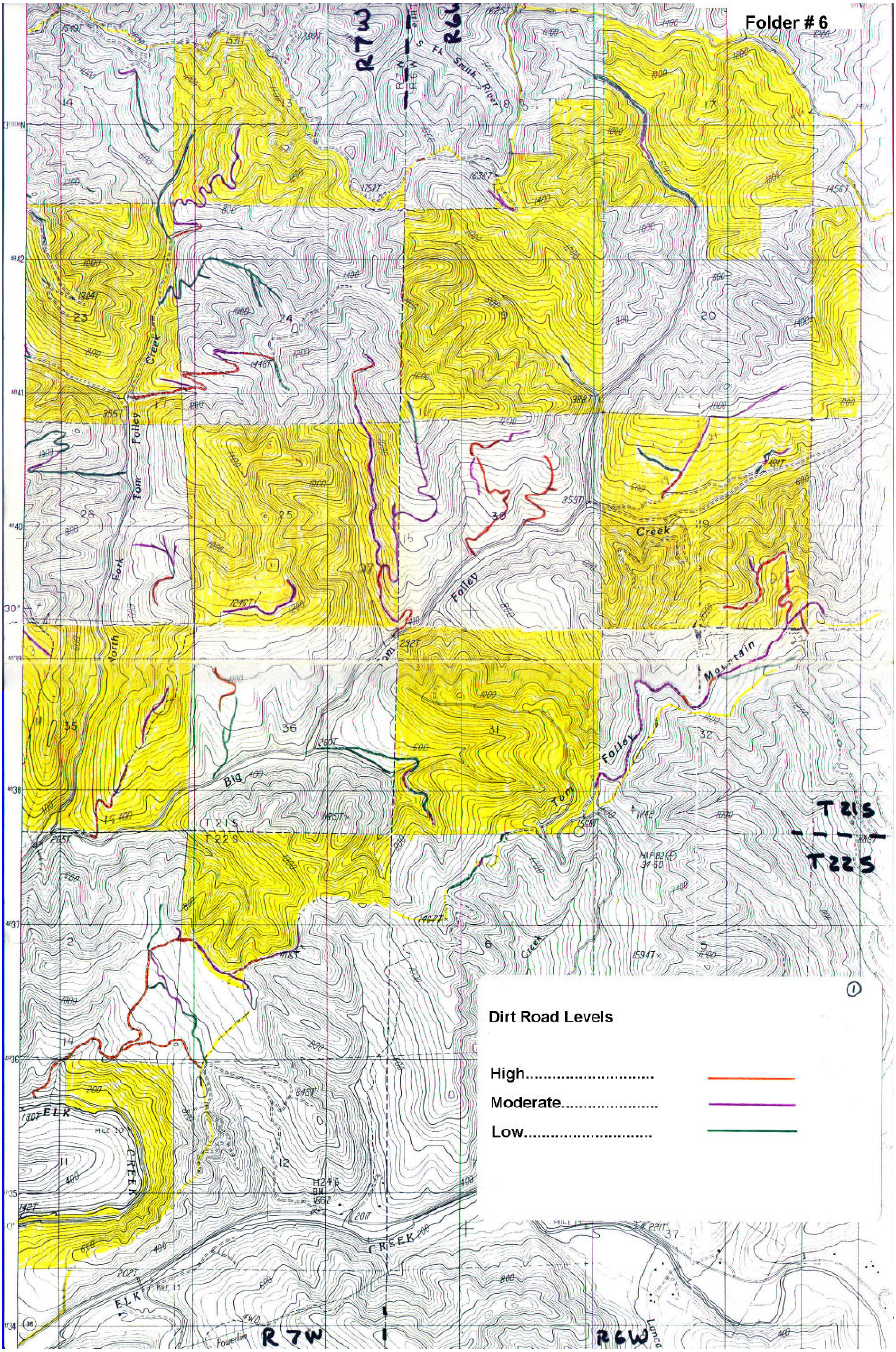
Road Surfacing

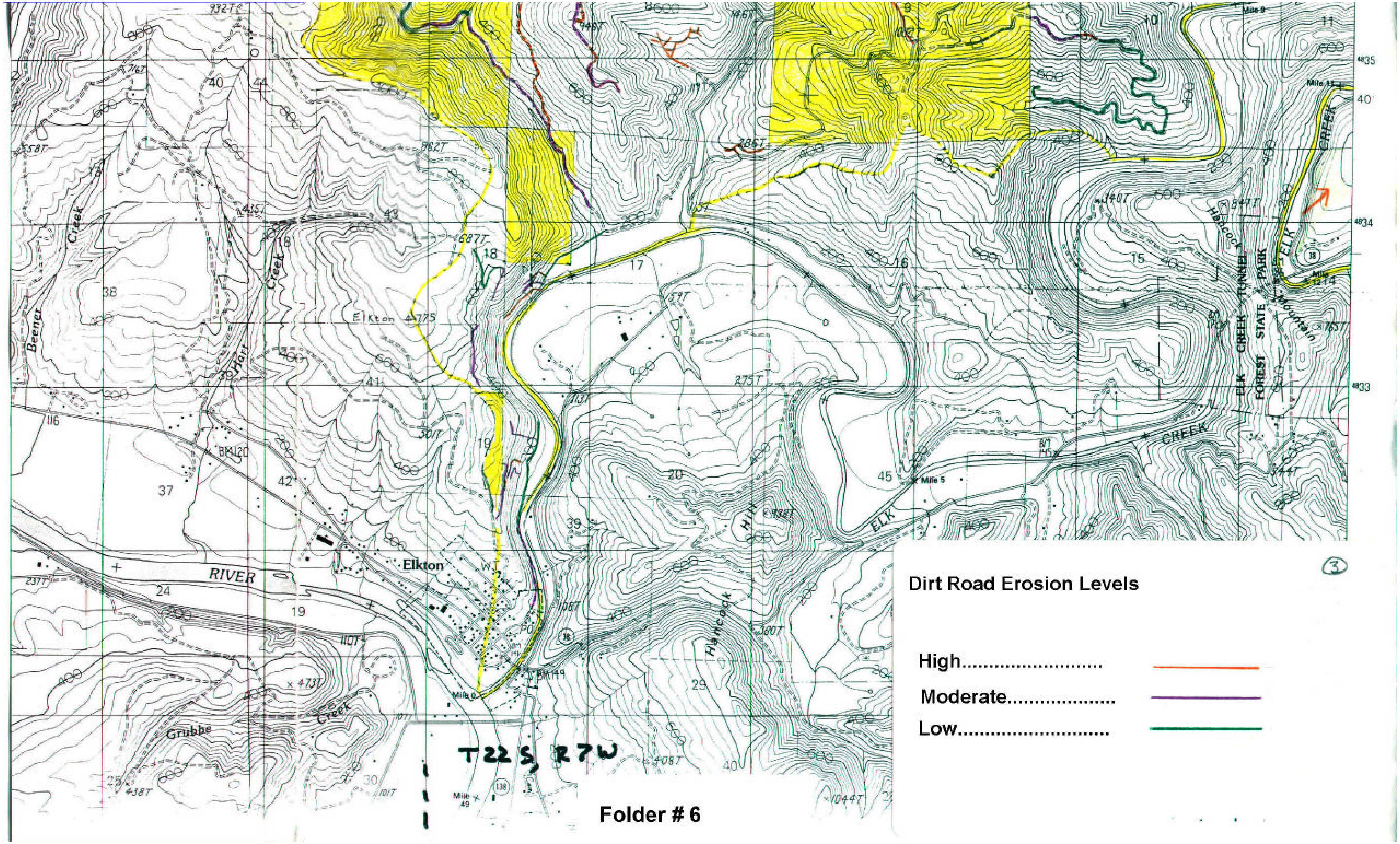
Asphalt......................

Rocked.....................

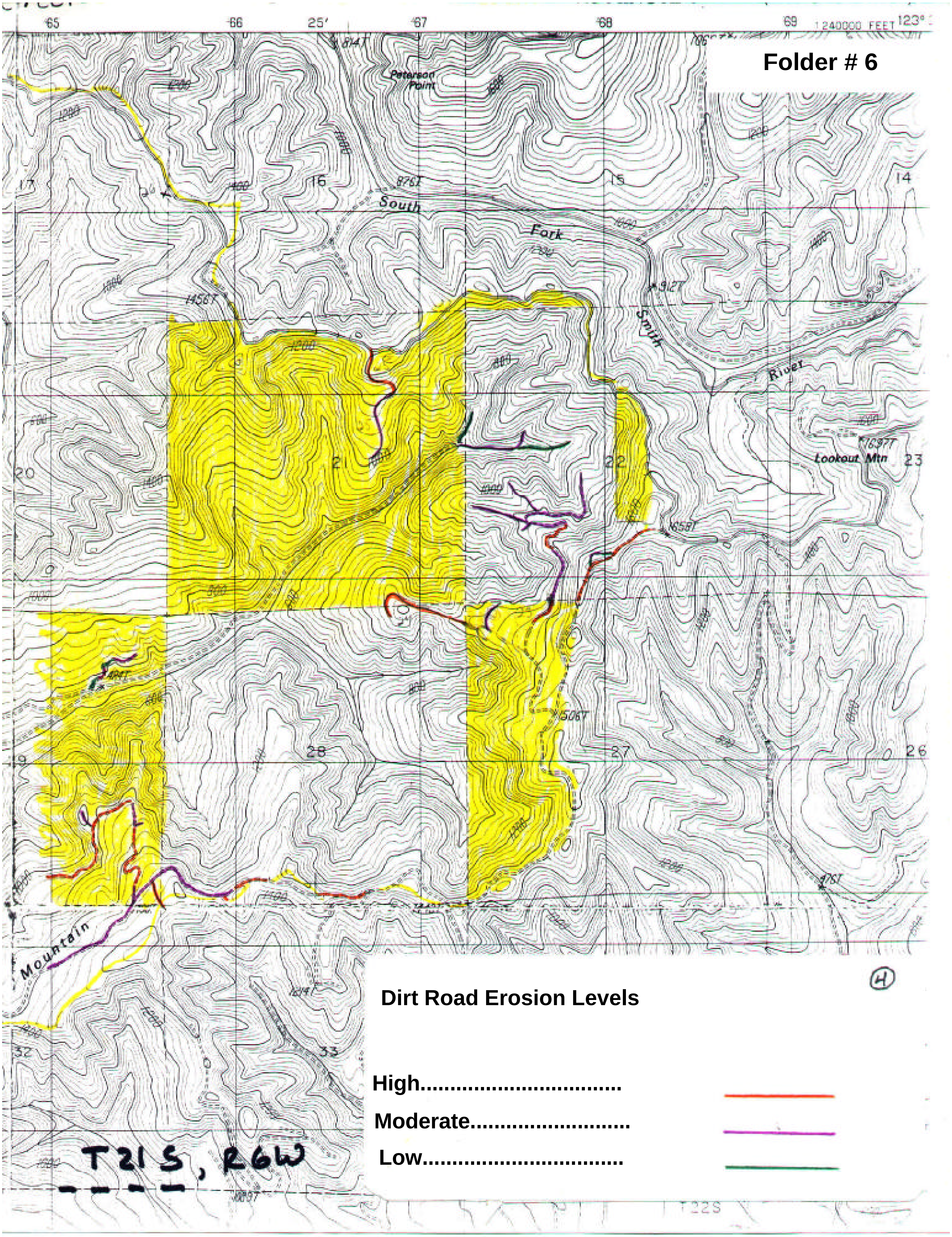
Dirt..........................

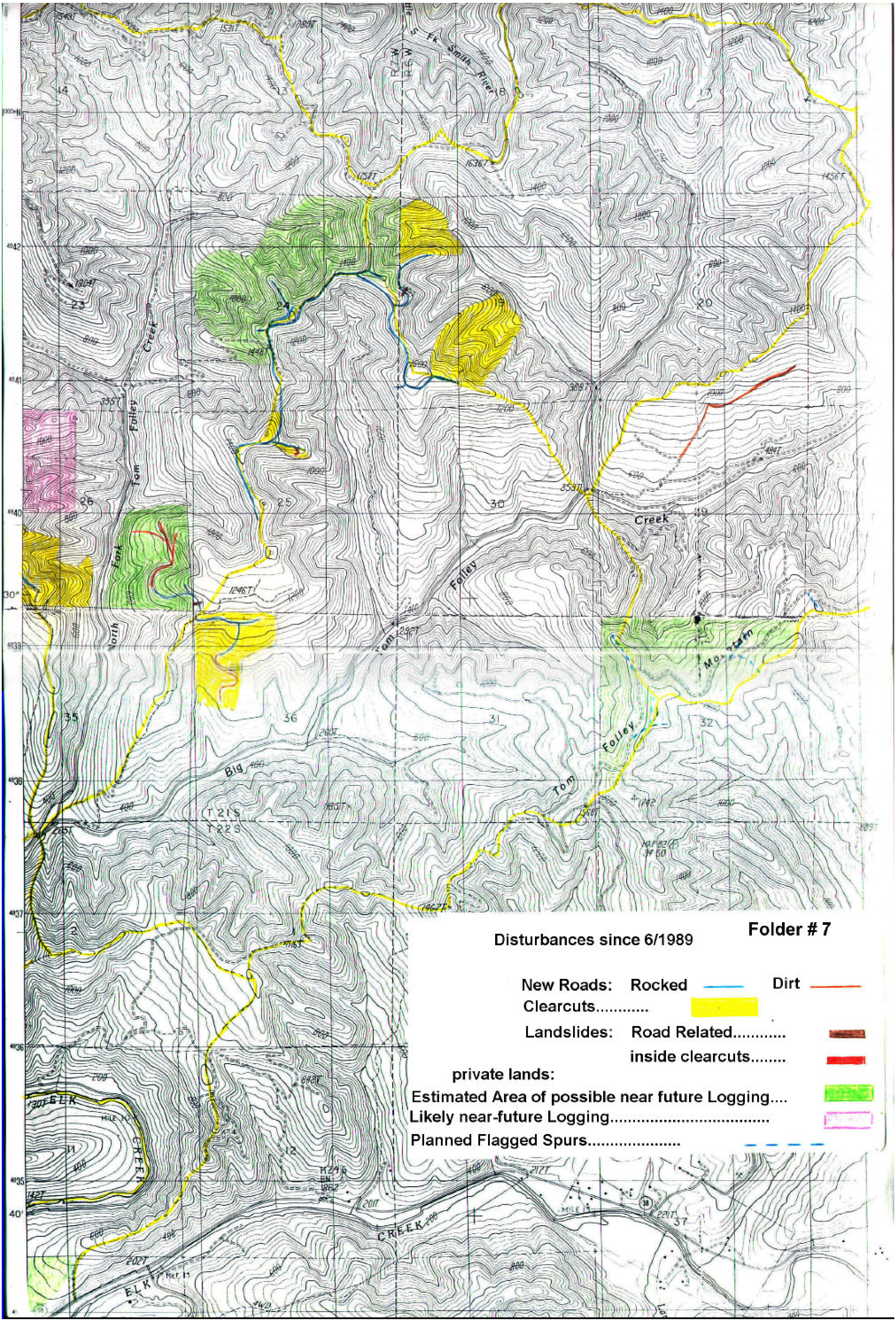

Folder # 6
Dirt Road Erosion Levels
High............................
Moderate......................
Low............................
Saddle Butte
Little
Tom
Folley
Creek
T21S
T22S


Folder # 6
R7W
R6W
T21S
T22S
S Fk Smith River
Tom Folley Creek
North Fork Tom Folley Creek
Folley Creek
Mountain
Big
Creek
ELK CREEK
Dirt Road Levels
High............................
Moderate......................
Low............................

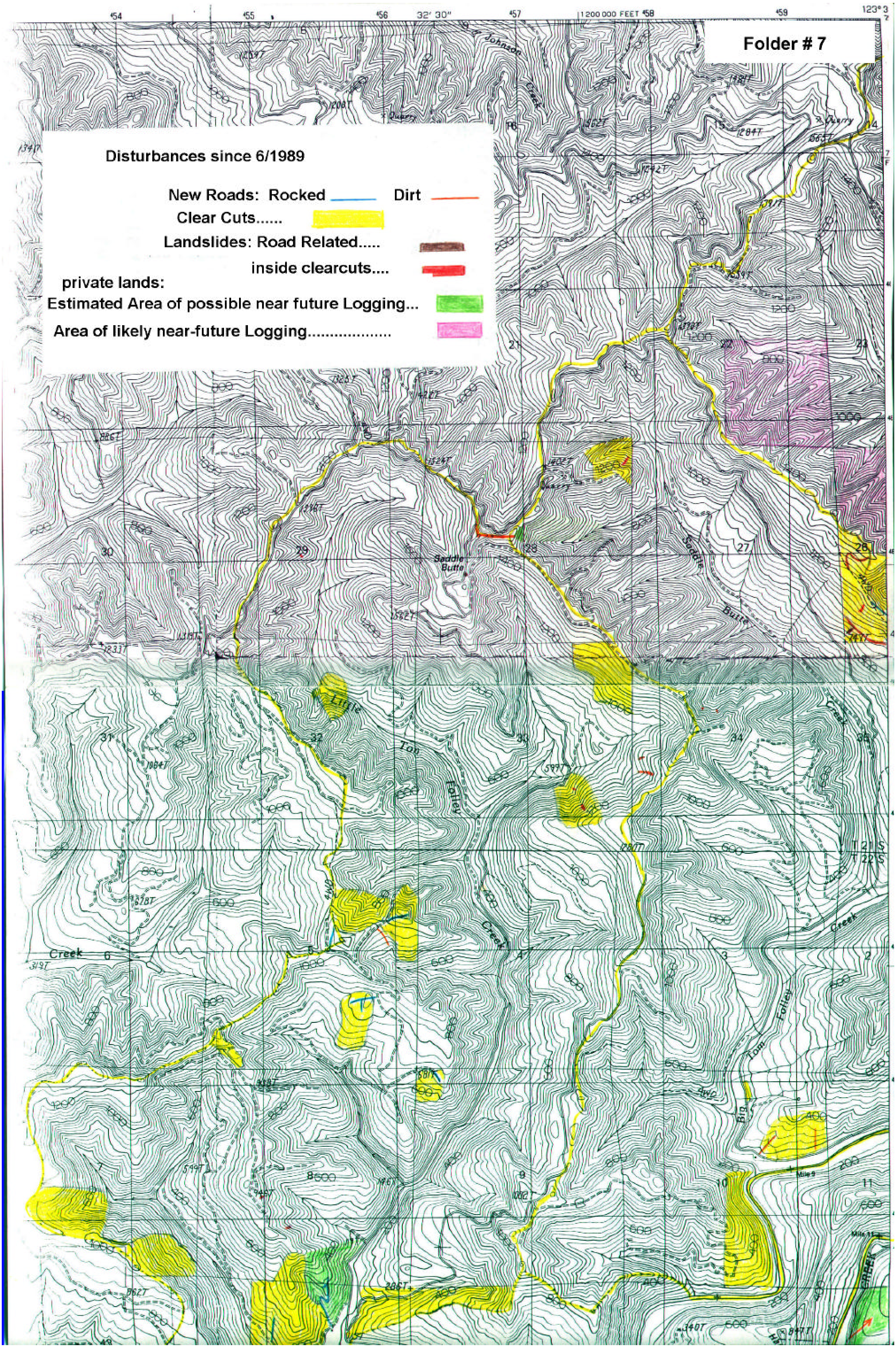


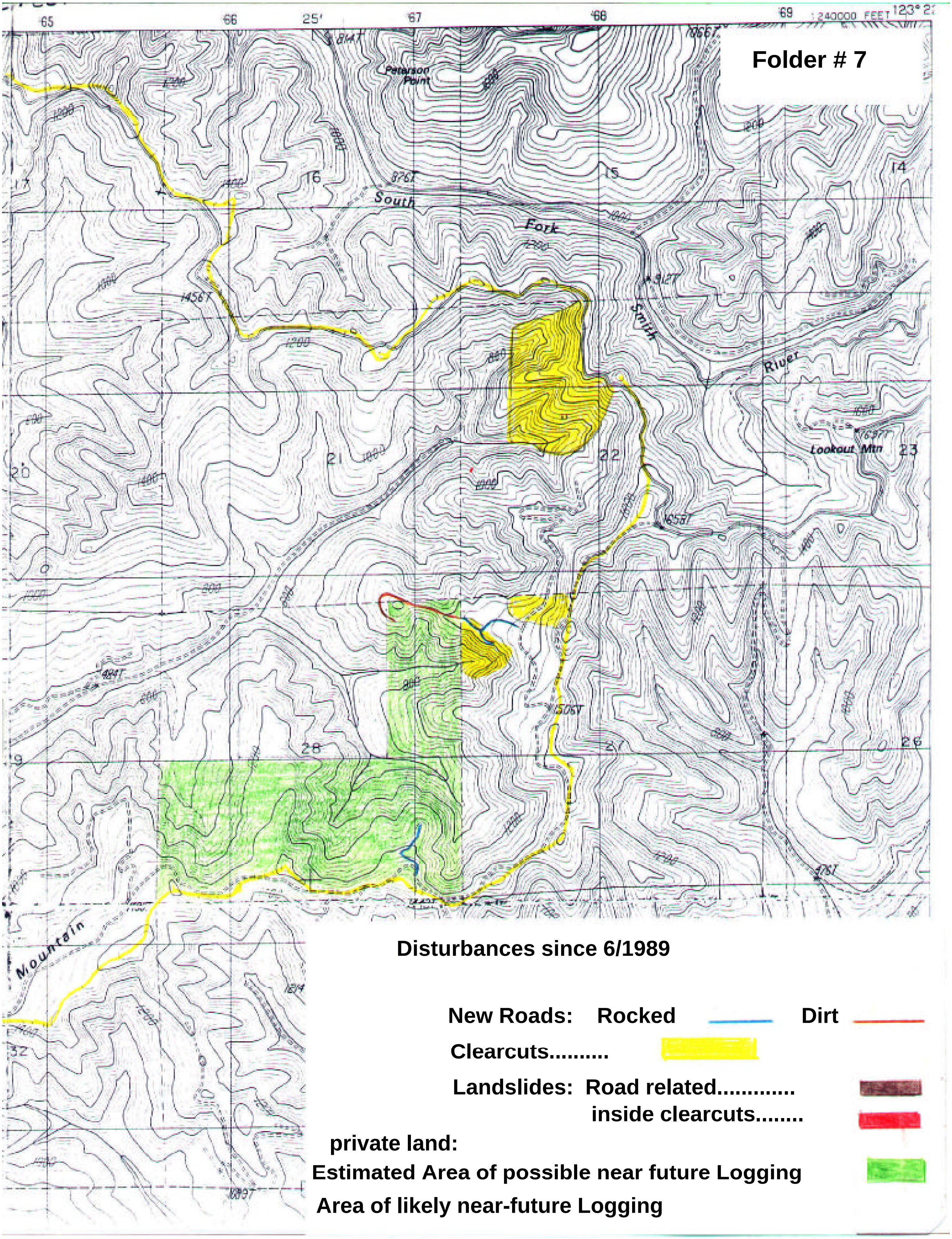
Dirt Road Erosion Levels
High
Moderate
Low
Elkton
RIVER
ELK CREEK
Hancock Hill
Hancock Mountain
Beener Creek
Hart Creek
Grubbe Creek
ELK CREEK TUNNEL FOREST STATE PARK
Mile 5
Mile 9
Mile 11
Mile 0
T22S, R7W
Folder # 6
③


Folder # 6
Dirt Road Erosion Levels
High.................................
Moderate..........................
Low.................................
T21S, R6W
South
Fork
Smith
River
Lookout Mtn
Peterson Point
Mountain
1240000 FEET
T22S

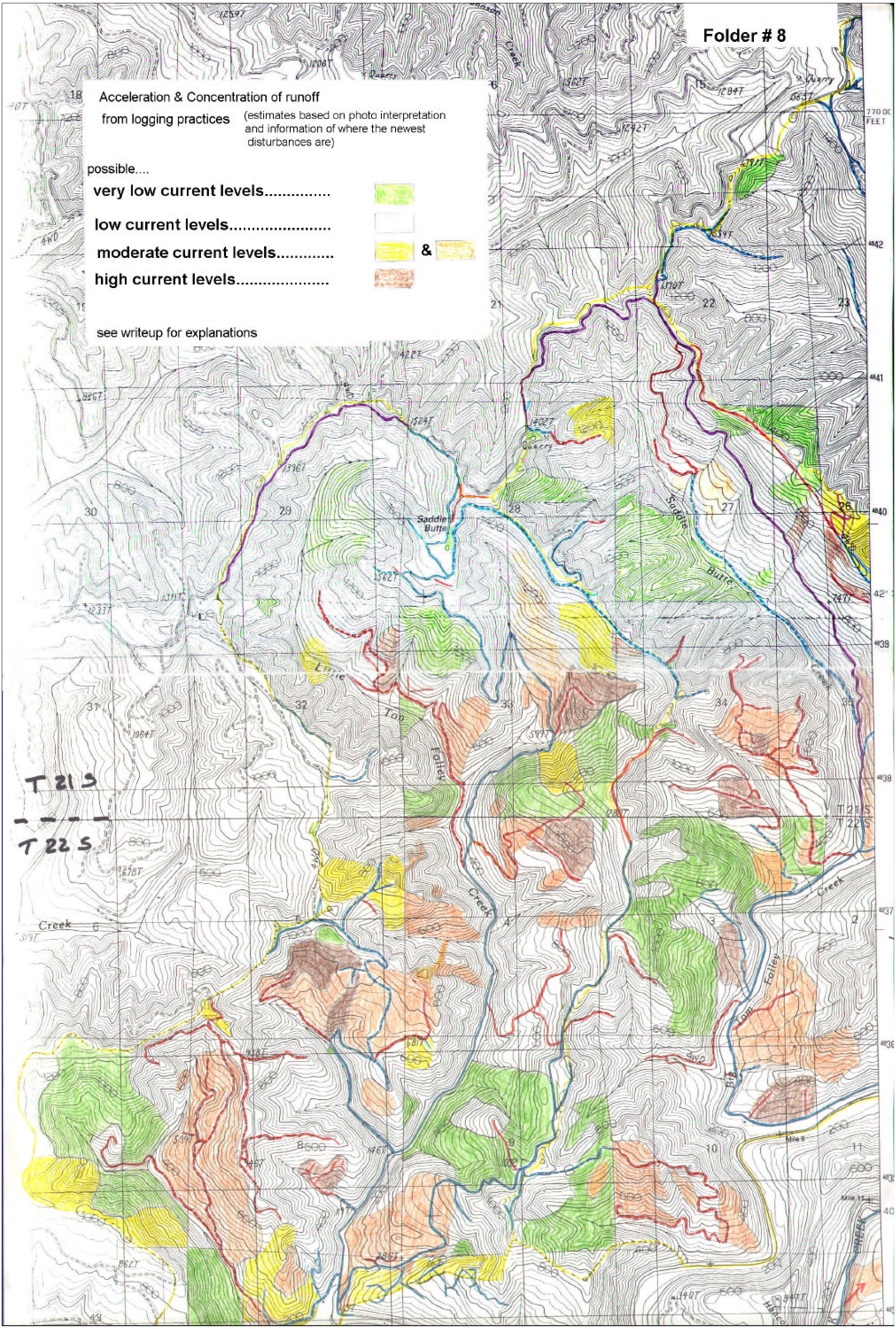


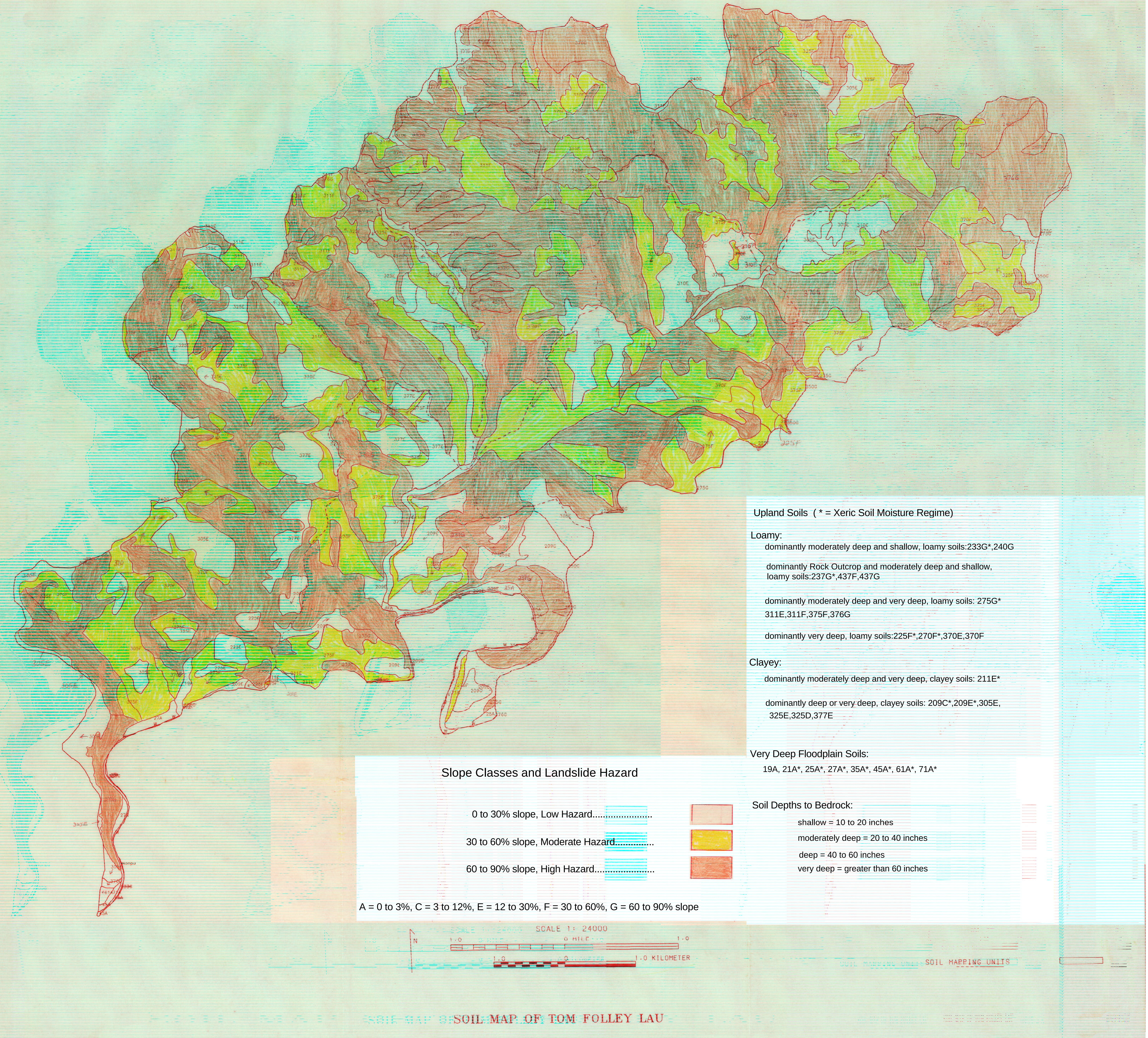
Folder # 7
Disturbances since 6/1989
New Roads: Rocked
Dirt
Clearcuts............
Landslides: Road Related...........
inside clearcuts........
private lands:
Estimated Area of possible near future Logging....
Likely near-future Logging...................................
Planned Flagged Spurs....................
Smith River
North Fork Tom Folley Creek
Tom Folley Creek
Big Tom Folley Mountain
T 21 S
T 22 S
ELK CREEK

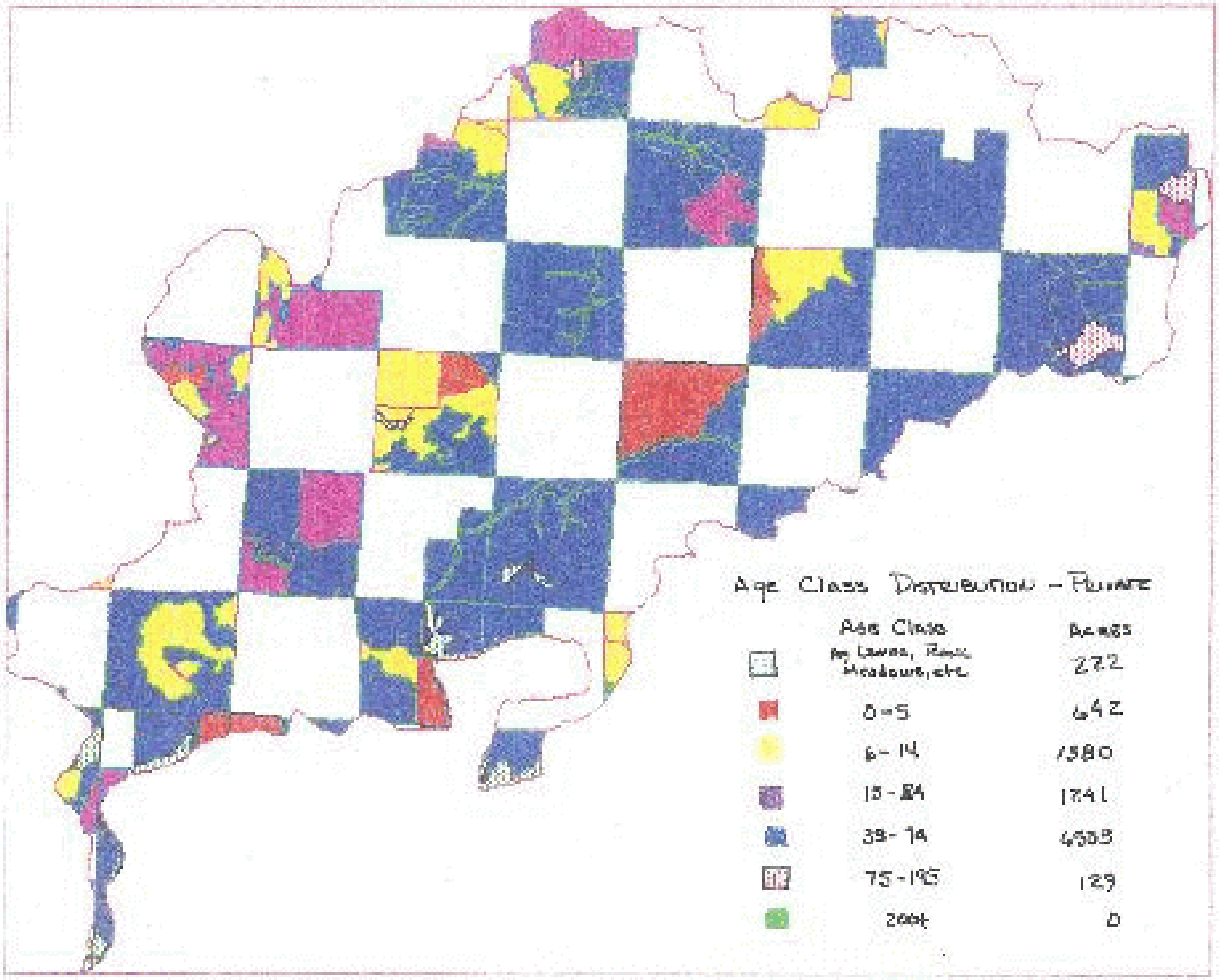

Folder # 7
Disturbances since 6/1989
New Roads: Rocked
Dirt
Clear Cuts......
Landslides: Road Related.....
inside clearcuts....
private lands:
Estimated Area of possible near future Logging...
Area of likely near-future Logging..................
Johnson Creek
Saddle Butte
Little Tom Folley Creek
Big Tom Folley
Creek
T 21 S
T 22 S
1 200 000 FEET
32′ 30″
123° 3

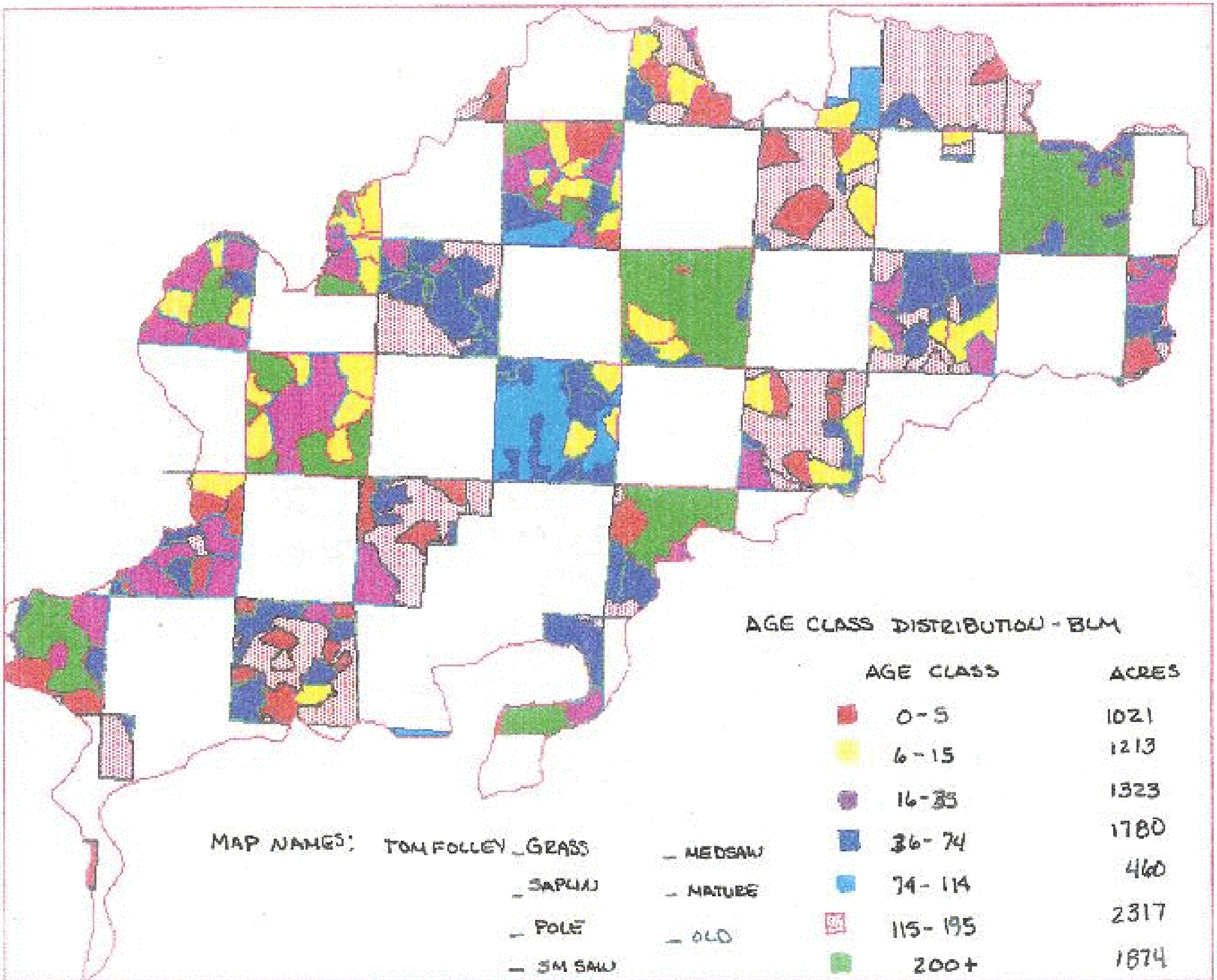


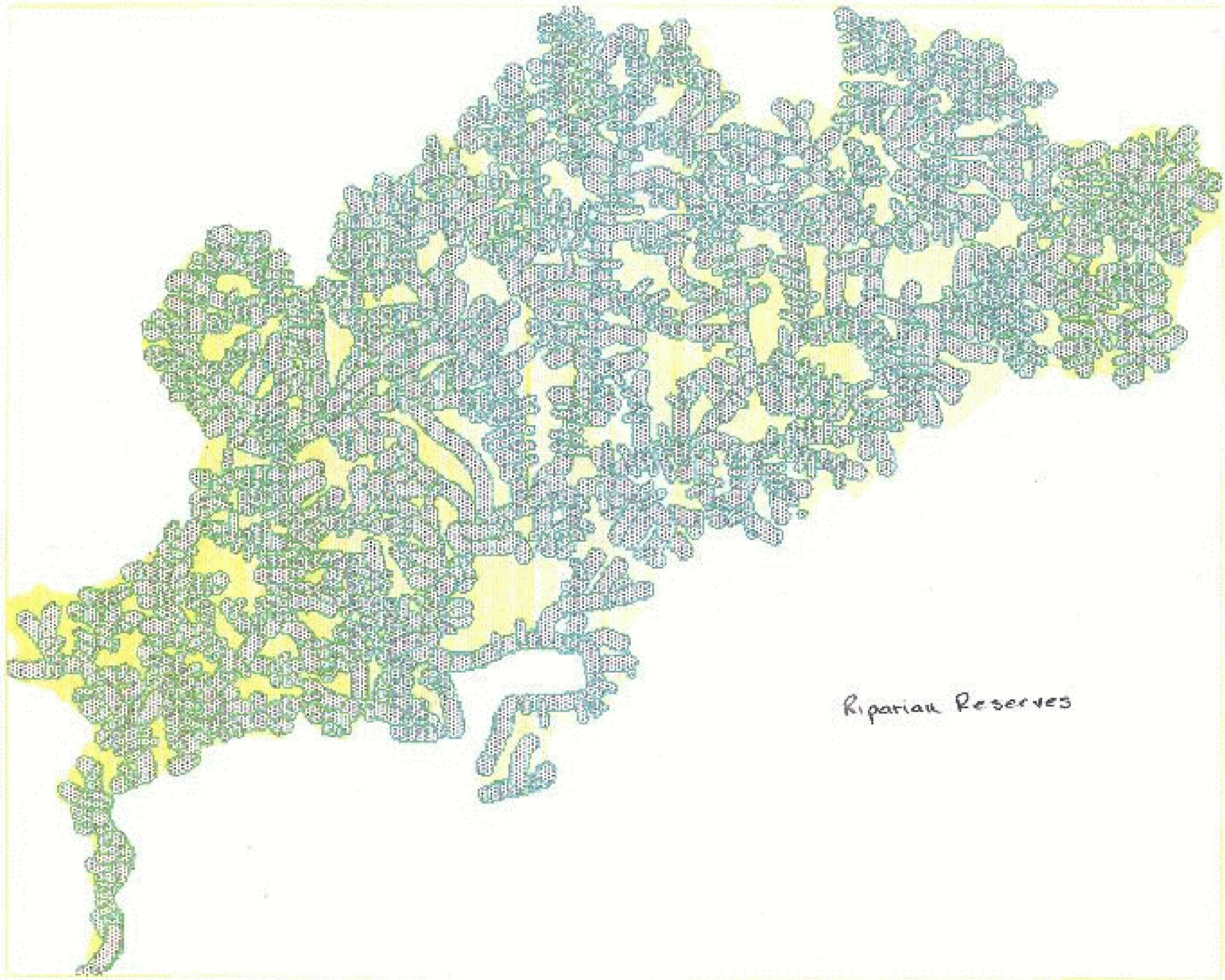
Folder # 7
Peterson Point
South
Fork
Smith
River
Lookout Mtn
Mountain
Disturbances since 6/1989
New Roads: Rocked
Dirt
Clearcuts..........
Landslides: Road related............
inside clearcuts........
private land:
Estimated Area of possible near future Logging
Area of likely near-future Logging

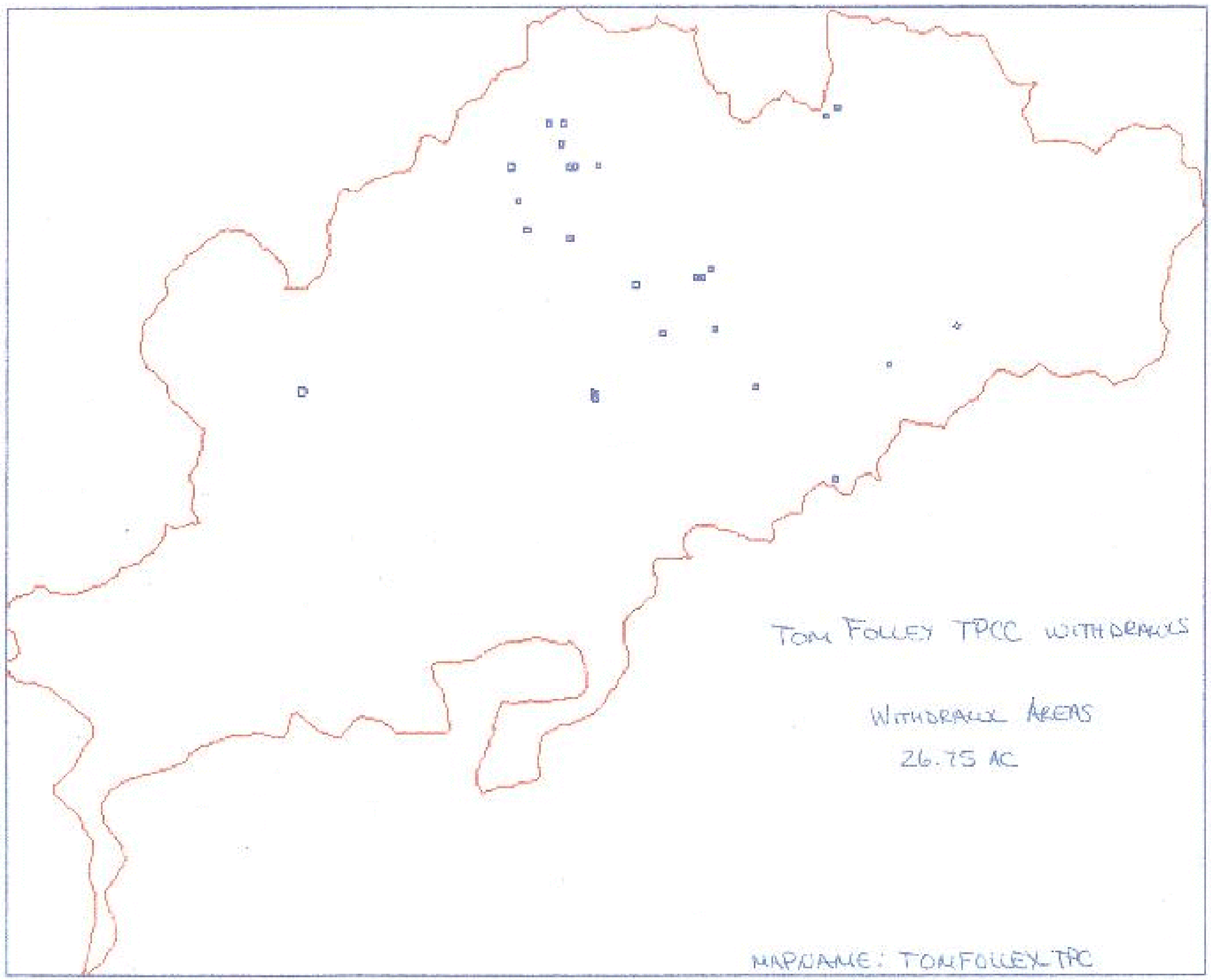

Folder # 8
Acceleration & Concentration of runoff
from logging practices
(estimates based on photo interpretation and information of where the newest disturbances are)
possible....
very low current levels..............
low current levels......................
moderate current levels............ &
high current levels....................
see writeup for explanations
Saddle Butte
Saddle Butte
Folley Creek
Creek
Quarry
T 21 S
T 22 S
T 21 S
T 22 S
Mile 9


Upland Soils (* = Xeric Soil Moisture Regime)
Loamy:
dominantly moderately deep and shallow, loamy soils:233G*,240G
dominantly Rock Outcrop and moderately deep and shallow, loamy soils:237G*,437F,437G
dominantly moderately deep and very deep, loamy soils: 275G* 311E,311F,375F,376G
dominantly very deep, loamy soils:225F*,270F*,370E,370F
Clayey:
dominantly moderately deep and very deep, clayey soils: 211E*
dominantly deep or very deep, clayey soils: 209C*,209E*,305E, 325E,325D,377E
Very Deep Floodplain Soils:
19A, 21A*, 25A*, 27A*, 35A*, 45A*, 61A*, 71A*
Slope Classes and Landslide Hazard
0 to 30% slope, Low Hazard.......................
30 to 60% slope, Moderate Hazard...............
60 to 90% slope, High Hazard.......................
Soil Depths to Bedrock:
shallow = 10 to 20 inches
moderately deep = 20 to 40 inches
deep = 40 to 60 inches
very deep = greater than 60 inches
A = 0 to 3%, C = 3 to 12%, E = 12 to 30%, F = 30 to 60%, G = 60 to 90% slope
SCALE 1: 24000
1.0 KILOMETER
SOIL MAPPING UNITS
SOIL MAP OF TOM FOLLEY LAU


Age Class Distribution – Private
Age Class
Acres
272
0-5
642
6-14
1380
15 - 34
1741
35 - 74
4585
75 - 195
129
2004
0


AGE CLASS DISTRIBUTION - BLM
AGE CLASS
ACRES
0 - 5
1021
6 - 15
1213
16 - 35
1323
36 - 74
1780
74 - 114
460
115 - 195
2317
200 +
1874
MAP NAMES: TOM FOLLEY _GRASS
_ SAPLIN
_ POLE
_ SM SAW
_ MEDSAW
_ MATURE
_ OLD


Riparian Reserves


TOM FOLLEY TPCC WITHDRAWLS
WITHDRAWL AREAS
26.75 AC
MAPNAME: TOMFOLLEY.TPC